THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., MARCH 20, 1890.

THE WEEK IN IRON CIRCLES.

General Features. An important reduction in west-bound freights on manufactured iron from Pittsburgh, the Shenango Valley and Cleveland is pending. In car load lots the rate, it is reported, will be reduced from fifth to sixth class; in less than car load lots from fourth to fifth class. The late influx of Southern iron into this territory by reason of the low rates made by the Southern lines is one of the reasons that may lead to this important reduction. Reports from leading Central and Western trade centers are as follows: Our correspondent at Cincinnati writes that the market has been active and large orders have been placed at prices that seem low compared with what Southern furnaces were holding at before the late break. This has alarmed the few speculators who still remain in the field, and they have hastened to unload at any prices they could get. The special lots thus forced have been small, but they have made considerable stir by their much offering. The Southern furnaces, during this little excitement, have rounded up an aggregate of probably 20,000 tons of orders, and already feel more independent as to further business. In Northern irons there has been some weakening but nothing like that in Southern brands, for reason that, with the exception of Bessemer and Lake ore mill irons, they did not advance so much under the speculative influences of November and December. Generally speaking, Southern irons are down $2.00 per ton from the December schedule, and Ohio softeners about half as much. Charcoal irons fluctuate but little, and while foundry and non-chilling grades are a little weaker, best chilling irons are active and strong. Old wheels are again in good request. Scrap is off about as much as pig. "The recent tumble in the price of Southern iron has had the effect of inducing considerable purchasing in all directions for these grades, and also for Northern coke irons," write Wm. F. Jarvis & Co., Detroit. "It is evident that buyers are satisfied with the new prices, and the effect of this purchasing, which in the aggregate will be a very large tonnage, may shape the market toward better figures in the near future. Lake Superior charcoal iron has been dull. A few transactions, however, have taken place, showing that prices are firm for this grade. It has been in no manner effected by the break in foundry irons, as far as can be seen at the present time." At Chicago heavier buying and lower prices are the story of the week just closed. The Illinois Steel Co., through its Bayview furnace, has been taking some heavy orders for foundry grades at prices hitherto not supposed to be possible. This led to some cutting by Southern furnaces to meet the competition, and all told, it is fair to say that on low grade foundry irons, prices are off about a dollar, as compared with the first of the month. Special foundry irons, prime Ohio softeners and the like, hold up firm. Some additional contracts recently let have brought out inquiries for more wheel irons and old car wheels. The Southern furnaces have shown a greater willingness to sell at a lower range of prices during the past week at St. Louis. Quotations vary widely and are irregular. Small orders are quite numerous but no large transactions reported. Ohio softeners continue fairly firm, but charcoal prices are weaker. With the foundries working full time, the prospects for a large consumption of iron this year are encouraging, and it is not unlikely that the present weakness in pig iron may be followed very shortly by a firmer market. There has been a lively skirmish for business during the past week at Louisville; but, notwithstanding the fact that liberal concessions have been made no trades of any magnitude have developed. Speculative lots figured prominently at the reduced figures; it was also developed beyond a doubt that furnace iron was offered in the same way. Buyers, as a rule, are well supplied for some time to come and are disposed to act conservative and buy only in small quantities. On present basis the market at Buffalo shows considerable life. There is still, however, a feeling of uncertainty among buyers, but sales have largely increased. The report last week from Pittsburgh might properly be repeated word for word and fairly represent the present market. If there is any difference it is in the downward direction. The Scotch iron warrant market is in a bad way. Speculation has undoubtedly received a decided check. The British labor market is also causing some anxiety.

Iron Ore. Very little is doing in the local market, but inquiries are steadily being received from Eastern parties who, however, seem to inquire for the purpose more of bearing the market than with a view to purchase. The ore dealers, on the other hand, have long ago sold quite enough of this year's product to feel perfectly comfortable, and are not disposed to make concessions, either at this or at some future time. The result, while somewhat in the distance as yet, will be that the ore yet unsold will go at the market price fixed by the sellers. Very little is doing in the vessel charters, and few shippers of ore care to employ any more carrying capacity than they now have under contract. There has been no change in charters, Escanaba freight being $1.05, Marquette $1.20 to $1.25, while $1.35 is paid from the head of the lake.

Pig Iron. The dullness in the market still continues, and while everybody looks hopefully to the future, the fact cannot be disguised that the business as shown by the transactions of the week is hardly encouraging. Bessemer pig is sold readily at $20 cash at the furnace, and all-ore No. 1 foundry iron is sold at about $18.50 on the same basis. What little iron is bought is barely enough to last the consumers from day to day, and the sale of round lots is seldom heard of. Strong furnace consumers rather discourage orders on the present basis, declining in some instances to book orders except at their own figures.

Merchant Iron. Steel billets are now selling for $33.00, a shortage of $3.00 from the highest price.

Coke. The current issue of the Connellsville (Pa.) *Courier* thus reports the condition of the coke market: The coke trade shrinkage noted in last week's review is aggravated by a short car supply, due to freight blockades on the railroads, chiefly the Pennsylvania system. The latter is badly blockaded on its main lines, both east and west, by an unusually heavy traffic. The railroad managers do not promise any immediate relief. They cannot say how long the heavy traffic will continue. Never in the history of the road has it been so great. The frequent wrecks on the road lately have disabled so many engines that their loss is greatly felt. The transportation of grain is unusually heavy. The opening of the West Virginia coal mines and the establishment of new coke ovens is one cause of the increased traffic. In consequence of these conditions, the coke region car supply is very much short of the requirements of trade. Eastern cars are especially hard to get. Western cars of the Pennsylvania Company and Lake Shore are also a scarce article just now. This shortage of Western cars is due to heavy through traffic and overtasked terminal facilities. With these exceptions, there are no new trade features. The region is running steadily five days in the week. Prices are firm, and labor is quiet and plenty at the wages.

BAD DAYS FOR THE WELSH TINNED PLATE MONOPOLY.

If there is any such thing as piling Ossa on Pelion in the world of trade, the Welsh tinned plate manufacturers must have experienced it when they heard of the determination of our House Committee on Ways and Means to place a duty of two cents per pound on that commodity. Brought face to face with the fact that the customer, who has been taking nine-tenths of their annual product, proposes to go into the same line of manufacture himself, and even now suffering from the effects of over-production, so that a radical restriction in output is seriously considered, our transatlantic friends look out upon the probable course of trade in 1890 and 1891 with anything but pleasant anticipations.

The Welsh manufacturers made, in 1889, 10,812,460 cwts. of tinned plates. Of these, they used at home only 2,200,000 cwts. The remainder, 8,612,460 cwts., they sold to consumers in the United States. All of this looks well enough on the surface, but the disturbing factor of the situation, not to speak of the prospective establishment of a tinned plate industry in this country, is the fact that, despite the above enormous aggregate of consumption, the productive capacity of the Welsh mills in operation at the opening of the year was 11,200,000 cwts. per annum, or 400,000 cwts. over the requirements of the markets. Here was "a condition, not a theory," that demanded prompt action, and an arrangement to shut down one week in four was in fair way of consummation at latest advices.

It will be a matter of some surprise, on this side of the water, to learn that, although there are 500 mills engaged in the production of this annual output of six hundred thousand tons of tinned plates, these mills being owned, nominally, by eighty or ninety different firms, the actual owners may be reduced to about forty-five, showing a monopoly which, located in this country, would have furnished the Free Trade theorists a never-ending theme of reiteration against the evils of a protective system.

STEEL RAILS AND THE TARIFF.

With such pabulum as this the Philadelphia *Record* daily regales its readers:

But what is essentially demanded by the Bessemer steel interests of Pennsylvania and other portions of the East is the repeal of the duty of 75 cents a ton on iron ore with the sea-water in it. This duty heavily and needlessly enhances the cost of producing steel rails. If the duty should be removed the manufacturers of Eastern Pennsylvania would soon be able to export steel rails and other products of steel, in competition with their European rivals. But the manufacturers of Chicago and Cleveland, who have abundance of raw material at their doors, and who would have nothing to fear from foreign competition if the duty on steel rails should be repealed, are opposed to granting to the Eastern manufacturers the boon of free ore. While the Western manufacturers largely control the interior markets, they are unwilling that the Eastern manufacturers should have an outlet to the sea.

The idea of ever exporting steel rails to England in any quantities, and for any length of time, is a dream, and only a dream. The present price of steel rails in Great Britain is unnaturally high and the break has already begun. English manufacturers can, if they choose, make rails much lower than we can ever hope to make them in this country, presupposing always that we maintain our present level of wages, which is admittedly much higher than that in England and Europe. For example, as aptly remarked by the *Bulletin* of the American Iron and Steel Association, steel rails, which have recently sold in Great Britain for $35 per ton, were sold in 1886 and 1887 in large quantities, by the same manufacturers, and of the same quality, *for exactly half the price recently charged*, or for $17.50 per ton. In April, 1888, they sold for $19, and less than a year ago, after the boom had commenced, the price had advanced to only $21.25 per ton. This shows what our British competitors can sell steel rails at in dull times, and still make money, while it as effectually vindicates the sound policy of maintaining a tariff, beneficial alike to the East and West, against the inroads of foreign cheap rails in times of low prices and general depression.

WHERE BRITISH MONEY GOES.

According to "Burdett's Official Intelligence," the total amount of listed securities quoted in the "Official List" of the London Stock Exchange in 1889 was (reduced to American currency) twenty-eight billion, forty-two million, nine hundred and ninety-nine thousand and two hundred dollars. This stupendous sum is not, of course, an exact measure of the amount of British money actually going into new investments, but it is sufficient to indicate the immense flow of capital in that country of capitalists. That there has been a rapid growth in such investments is evident from the fact that the aggregate for 1889 is two billion, four hundred and seven million, one hundred and one thousand, four hundred and thirty-six dollars in excess of that of 1885. Included in these investments are British funds, corporation stocks, colonial government bonds, foreign stocks, railways (ordinary, leased lines, debenture stock, guaranteed and preference stock), Indian railways, American railways, banks, breweries, canals and docks, financial, land and investment, gas, insurance, coal, iron and steel, mines, shipping, tea and coffee, telegraphs and telephones, trams and omnibuses and water works. The amount invested in American railways is put down as follows:

American railroad shares	$1,198,205,677
American bonds (currency)	1,295,586,075
American bonds (sterling)	200,352,907
Total	$2,694,144,659

The figures for 1890 will, no doubt, show a large increase, especially in American investments, and their appearance will be doubt be awaited with interest.

A CORRECTION AND A COURTEOUS TRIBUTE.

We gladly make place for the following note from the editor of a widely recognized organ of the iron, steel and coal trades of Great Britain, first, in order to correct an unintentional injustice, secondly, to acknowledge the courtesy contained in the final sentence:

THE IRON AND COAL TRADES REVIEW,
342 STRAND, LONDON, W. C., Feb. 1, 1890.

DEAR SIR:—I beg to call your attention to the fact that in the issue of *The Iron Trade Review* of January 16, you give to the *Colliery Guardian* credit for an article (copy of which I enclose) which appeared in this journal December 27. To show that this is the case I am sending copy of the latter date. Some one in your office has evidently been guilty of an oversight, but as I have noticed the same error in one or two previous occasions I feel bound to call your attention to the matter. At the same time, allow me to congratulate you on the steady improvement which I observe in your own journal.
Believe me, faithfully, J. O. CONNELL, Editor.

The Editor *The Iron Trade Review*.

The article in question was headed "Ship-building in 1889," and the crediting of the article to another London paper was purely an inadvertence which we shall endeavor to avoid in the future.

STOCKS OF IRON IN WARRANT YARDS.

The official organ of the New York Metal Exchange is authority for the following statement regarding the stocks of iron in warrant yards in this country (mainly in the South) on the dates mentioned:

	Put In.	Taken Out.
Prior to October 1st, 1889	7,200 tons.	.....
During October, 1889	4,700 "	.....
" November, 1889	12,700 "	.....
" December, 1889	10 800 "	300 tons.
" January, 1890	6,300 "	400 "
" February, 1890	8,3 0 "	800 "
March 1st to 10th, 1890	2,830 "	nil.
Total	52,800 tons.	1,500 tons.
Net stock, March 11th, 1890	.....	51,300 "

Since the above aggregate represents considerably less than one-third the present weekly blast furnace capacity of the country, it does not look as if the scheme was making progress to any alarming extent. And for this the legitimate iron trade should be proportionately thankful.

THE following press dispatch from Pittsburgh rather takes the wind out of some recent able articles in the editorial columns of our Southern exchanges:

The attempt to create a market in this city for Southern Bessemer pig has proven a failure. The first shipment to reach here was consigned to Carnegie Brothers & Co., and it arrived here the first part of last week. There were only a few carloads, but there was enough to convince the Carnegie people that they had no use for Southern pig iron. The broker who sold the iron was notified that it was not up to the standard guaranteed, and he was requested to take it out of the yards of the mill. When asked if the firm had ever bought any Southern pig, a member replied: "Last June we purchased 2,000 tons of Bessemer pig metal, which was to have been delivered in October. The first few carloads arrived this week, and the iron was of such an inferior quality that we were compelled to refuse to receive it. It was not up to guarantee, and it was a grade of iron that would have to be sold in this market as off-grade Bessemer, not fit for ordinary use. Southern ores are not of the proper composition to be used in the making of Bessemer pig, and it will never be shipped to this district on an extensive scale."

What becomes of those New Albany tests which demonstrated, or were supposed to demonstrate, the value of this brand of pig iron?

THE Census Bureau is showing commendable zeal in securing data not heretofore obtainable. Its inquiry into the use of fuel gas will be especially interesting. That it will be comprehensive and accurate there can be no doubt when it is stated that the work will be in the hands of Mr. Geo. W. Graeff, Jr., the accomplished editor of *Light, Heat and Power*, Philadelphia.

THE Missouri Anti-Trust Law has been declared unconstitutional by Judge Dillon, of the United States Circuit Court, on a

minor point, however. The question arose on the authority of the Secretary of State to withdraw the charter of the Simmons Hardware Company, of St. Louis, on its refusal to make oath as to whether it was connected with any trust or combination. The court holds that this method of enforcing the act is unconstitutional. Hence, the act falls to the ground, regardless of the main question at issue, regarding the legality of trusts *per se*.

EUROPE to-day is standing on a volcano.—[St. Louis Age of Steel.

Arguing in the *Age of Steel's* usual way, we do not see any special harm in a volcano. Indeed, volcanoes, within certain limits, may be of considerable benefit to the human race. At any rate, we do not see the necessity of getting scared on the subject. Volcanoes are here to stay, and we might as well adjust our affairs so as to get the benefit of any rise in real estate, in the event of an eruption.

ACCORDING to the census-guessers, Milwaukee and Buffalo will closely contest with Cleveland the eleventh place in the galaxy of American cities. The cities falling below these, in their supposed order, are: Washington, Minneapolis, Pittsburgh, Detroit, Louisville, Kansas City and St. Paul.

THE Marquette *Mining Journal* does this paper the honor of saying that the new *Marine Review*, of this city, "from its appearance, promises to be to the shipping interests what that other excellent Cleveland trade paper, *The Iron Trade Reriew*, is to ore producers."

Claims a Patent on It.

TO THE EDITOR OF THE IRON TRADE REVIEW:

I notice that you published in your issue of January 23rd, 1890, fourth page, an article entitled "Receiving Tanks on Heating Systems." It might be just as well to also publish the fact that a patent has been granted on that especial method, and also, that any one constructing and operating such a system without the the consent of the patentee, would thereby infringe and become liable to damages. I enclose diagram herewith of exactly what you published, viz: "the holding of a water-line in the heating apparatus."

Yours respectfully, TIMOTHY KIELEY.

7-11 WEST 13th ST., NEW YORK.

PROTECTION AND PRICES OF IRON.

Mr. A. M. Garland, Secretary of the Illinois Branch of the American Protective Tariff League, sends us the following: It has been said by economists that the material progress of a nation is quite accurately indicated by its consumption of iron. Especially is this true as applied to the United States, where advancement finds no parallel in the world's history. It must be evident to every student of the situation that we could not use iron so abundantly as now if it was not produced at home. In the first place, we could find nothing with which to pay for it, because many of the products of our agriculture and other industries could not be exported to pay for iron made abroad; and, secondly, it is equally evident that without home competition the price of iron made abroad would be beyond reach of most of those who are now its heaviest consumers.

The home production of iron not only benefits consumers by enabling them to pay for vastly more than they otherwise could command, but it equally benefits them by keeping down prices. History proves this to be true. British iron that sold here for $40 per ton in 1849, under the "revenue tariff" of 1846—when American iron of better quality was offered for $50, and could not be sold for less—rose to $80 per ton a few years later when we began to extend our railroad system.

Men are yet in business who can remember when in our hardware stores American-made goods were the exception. Now nine-tenths of our hardware, including heavy goods, are of home manufacture, and, in the case of saws, axes, tools, cutlery and all kinds of builders' hardware, we are heavy exporters. And it is a most significant fact that among our best customers for these products of a protected industry are the colonies of Great Britain. A glance at Canads's imports for 1888 shows that there came from the United States of hardware over eighty per cent.; brass goods, eighty-one per cent.; copper manufactures, eighty-six per cent.; cordage, ninety-four per cent.; ginghams, eighty eight per cent.; glass manufactures, sixty-five per cent.; rubber goods, ninety-nine per cent.; printing ink, ninety-four per cent.; carpets, fifty-four per cent.; tinware, ninety-one per cent.; wall-paper, ninety per cent.; paper manufactures, seventy-two per cent.; oil cloth, fifty-two per cent. Such an array of business facts as this, with the practical man, is worth more than all the theories of all the free-trade writers on both sides of the ocean.

A DISGRACE on the American Government is embodied in the statement made in our American exchanges that Messrs Frazer & Chalmers, of Chicago, who are probably the largest manufacturers of mining machinery in the world, are establishing branch works in England, to enable them to make shipments direct to Europe, Asia, Australia and Africa, no such facilities being available from American ports. The disgrace consists in the fact that the American Government studiously abstains from rendering any assistance whatever to its merchant marine in the way of such favors as Great Britain bestows on her shipping, and which has chiefly from this cause made her the greatest maritime power on the globe.—[Canadian Manufacturer.

CONDITION OF THE BLAST FURNACES OF THE UNITED STATES.

March 1, 1890.

[CONDENSED FROM THE AMERICAN MANUFACTURER.]

LOCATION OF FURNACES.	CHARCOAL. Total No. of Stacks.	CHARCOAL. In Blast. No.	CHARCOAL. In Blast. Week'y capacity.	CHARCOAL. Out of Bl'st. No.	CHARCOAL. Out of Bl'st. Week'y capacity.	BITUMINOUS OR COKE. Total No. of Stacks.	BITUMINOUS OR COKE. In Blast. No.	BITUMINOUS OR COKE. In Blast. Week'y capacity.	BITUMINOUS OR COKE. Out of Bl'st. No.	BITUMINOUS OR COKE. Out of Bl'st. Week'y capacity.
New England	13	6	518	7	585					
New York	9	3	413	6	747	4	3	2,855	1	1,033
Pennsylvania	20	6	465	14	745	1	1	750	0	0
Upper Susquehanna Valley						1	0	0	1	200
Pittsburgh						21	19	23,579	2	1,654
Spiegel						1	1	887	0	0
Allegheny Valley						2	1	539	1	125
Shenango Valley						20	16	11,682	4	1,992
Youghiogheny Valley						5	4	2,317	1	132
Juniata and Conemaugh Valleys						19	14	6,662	5	2,476
Spiegel						1	0	0	1	250
Maryland	8	3	294	5	478	3	1	1,686	2	1,826
Virginia	22	1	59	21	1,175	14	11	5,797	3	644
North Carolina	2	1	98	1	85					
West Virginia	3	0	0	3	190	6	3	1,716	3	1,495
Ohio—Mahoning Valley						14	13	11,526	1	801
Eastern, Central and Northern						18	13	10,152	5	3,478
Hocking Valley						15	5	1,501	10	2,213
Hanging Rock	14	3	201	11	931	14	8	1,954	6	1,368
Miscellaneous										
Kentucky						5	3	913	2	720
Hanging Rock	2	1	56	1	116					
Western Region and Miscellan'ous	2	0	0	2	154					
Tennessee	9	5	1,232	4	355	12	9	5,060	3	685
Georgia	3	1	175	2	198	2	0	0	2	1,193
Alabama	13	10	2,363	3	952	36	24	11,813	12	6,083
Indiana						2	2	380	0	0
Illinois						16	10	11,593	6	4,487
Michigan	25	11	3,763	14	4,531	1	0	0	1	300
Wisconsin	6	4	1,960	2	270	4	4	2,588	0	0
Minnesota						1	0	0	1	140
Missouri	2	2	626	0	0	6	3	1,821	3	1,720
Texas	1	0	0	1	180					
Oregon	1	0	0	1	172					
Colorado						2	1	805	1	519
Utah										
Washington	1	0	0	1	205					
Total charcoal and coke	156	57	12,223	99	12,069	246	169	119,321	77	35,534
Total anthracite	181	116	48,286	65	17,616					

SUMMARY.

FUEL.	IN BLAST. Number.			IN BLAST. Weekly Capacity.			OUT OF BLAST. Number.		OUT OF BLAST. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	57	61	59	12,223	12,653	11,561	99	94	12,069	11,878
Anthracite	116	112	100	48,286	45,681	33,382	65	69	17,616	18,473
Bituminous	169	166	152	119,321	116,198	97,783	77	76	35,534	36,199
Total	342	339	311	179,830	177,132	134,815	241	239	65,219	65,550

A BIG STEAM ENGINE.

The large engine which has been under construction at the Fishkill Landing Machine Works for the past six months is a great piece of work in the line of machinery, and to those who visit the establishment daily it is wonderful to behold. It stands just inside of the doors of the main shop and it extends in height through an opening of the second floor of the building. The engine is of the Corliss type, and is for the New York Central & Hudson River Railroad Co., to be used in a grain elevator in New York City. In power and weight it is the largest and finest engine ever built at these works. It is similar to the monster Corliss engine which hundreds of our citizens saw running in Machinery Hall at the Philadelphia Centennial in 1876, though not so large, and that was a beam engine, and this is known as a vertical condensing engine. To give our readers an idea of what this massive and beautiful engine is, we will give a description of it without going into minor details. The cylinder is set in the top of two cast iron frames, which are fastened in the bed plate, making the total height of engine 26 feet. The base of the engine occupies a floor space of only 13 feet by 8 feet. The cylinder is 52 inches in diameter and 42 inches in stroke; the casting of the cylinder weighs alone over five tons. The steam pipe is 12 inches in diameter; the exhaust 16 inches in diameter, connecting the cylinder with the condenser, which is set between the two frames. The air-pump is enclosed in the condenser, and the plunger receives its motion from a double beam, which is connected to the cross-head by means of links. The crank shaft is a solid piece of wrought iron, 18 inches in diameter, 20 feet long, and weighs nearly nine tons. The crank-pin is 10 inches diameter and 12 inches long. The fly-wheel is made in four pieces in the form of four half wheels; these pieces are bolted together so as to form two separate wheels, which, when joined together, form an immense wheel, 18 feet in diameter, 55 inches across face and weighing altogether 65,000 pounds. For convenience of inspecting the different working parts of the engine, it is divided into two parts or stories by cast iron platforms, which are reached from the floor of the engine room by cast iron stairways; the platforms are supported by braces from the frames, and a railing made of brass pipe, supported by wrought iron stanchions, forms a safeguard around the platforms, the hand rail of the stairway being made in the same manner. The motive power of the engine is estimated at 1,000 horse power, and when completed it will weigh 100 tons. The machine company expect to have it completed within a month, and when it is shipped to New York it will require five or six cars to carry it.—[Fishkill (N. Y.) Journal.

A NOISELESS wheel has a cushion tire.

THE THOMSON ELECTRIC WELDING PROCESS.

In the language of Mr. H. A. Royce, General Manager of the Thomson Electric Welding Co., of Boston, Mass., to a representative of *The Iron Trade Review*, that company "is making history these days." Some valuable expert reports of quite recent date are before us, from which we make the following interesting extracts:

Mr. Alexander B. W. Kennedy, F. R. S., Vice-President of the Institute of Mechanical Engineers, etc., London, who recently visited the United States to inspect the process, in a report dated February 1, 1890, to the City of London Contract Corporation, Limited, says:

"The works of the Thomson Electric Welding Co, at Lynn, Mass., were started about a year since, but they have only been finished about five months. They now employ about 250 men, and I found the shops stocked with excellent tools and full of work, which consisted entirely of Thomson welders and the dynamos for working them. Up to the time of my leaving America, thirty-six welders of all types, with the necessary dynamos, had been actually delivered at works in various parts of the United States, while forty-three others were in hand in the shops, on order for different commercial processes. The following is a summary of the work on which these machines are, or are intended to be, engaged:

Iron and steel wire	9
Hard steel (gun) wire	2
Copper and brass wire	8
Copper rods etc., to 1 inch diameter	4
Pipe, from 2 to 6 inches diameter	4
Axles, tyres and wagon work	35
Miscellaneous hardware	7
Brazing and welding	3
Upsetting collars on axles	2
Steel wire, cable welding	2
Lead strips	1
Street rail splicing	1
Upsetting bridge eye-bars (6 inch by 1 inch)	1
Total	79

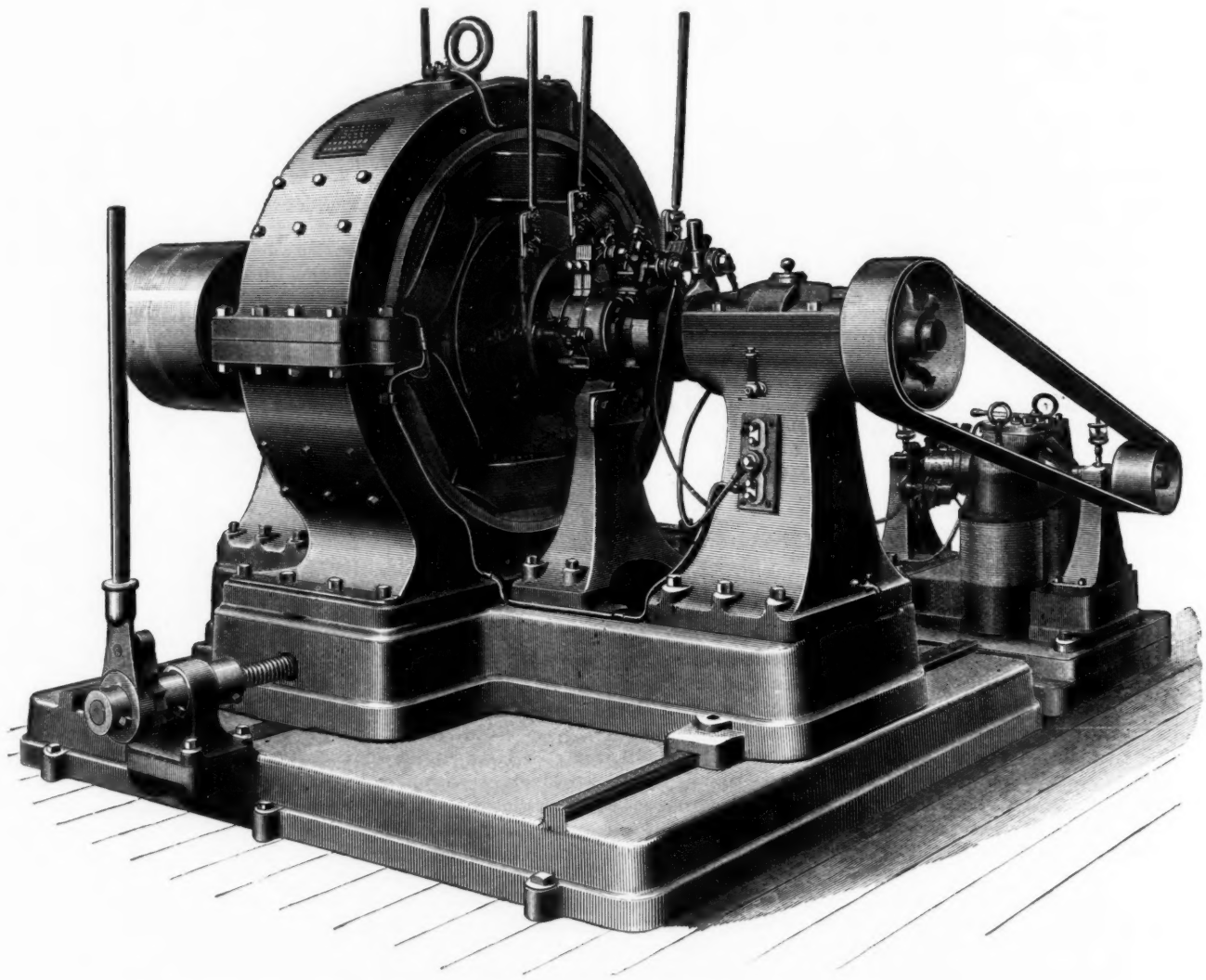
As of especial interest to our readers, we extract from Mr. Kennedy's report only such portions as relate to manufactures of iron and steel:

"The welding of iron and steel wire was one of the first matters successfully carried out by the company. I saw at the works of Messrs. Roebling, Sons & Co., at Trenton, a welder which had been at work there for about thirteen months, for a great part of the time twenty hours per day, and the counter of which showed that 193,890 welds had been made with it. I also examined another wire welding machine at the Trenton Iron Works (Messrs. Cooper, Hewitt & Co.) which had done about nine months' work, and had made 22,095 welds, and, at the same works, a portable machine, recently installed, which had made 9,022 welds. This last machine was so arranged that it could be carried about easily by two men, and connected with the mains at any part of the immense shop in which it was placed, so as to be used for mending or other welding wherever required, without the necessity of bringing a heavy coil of wire to it."

Concerning the butt welding of tubes, Mr. Kennedy says:

"I found that 2½-inch iron tubes, ¼ inch thick, were welded in sixty-one seconds, the net horse-power required at this speed being 23.4 (say 33 indicated horse-power) per square inch of section. I also had some 1⅛-inch brass tube, ⅛ inch thick, welded to iron tube of same size, which I found to require 21.2 net horse-power (say 30 indicated horse-power) per square inch of section, the current being on twenty-four seconds for each weld. In some of these cases, as in others which I have already mentioned, a little light hammering was done on the weld. Machines have been delivered and at work, I was informed, commercially for the welding up of refrigerator coils in iron pipe, and also for the welding of brass 'safe-ends' to boiler tubes. It is noteworthy that the burr formed at the tube weld all comes to the outside, and does not at all choke the tube. In the case of boiler tubes, especially, the whole of the outer burr has to be removed by grinding or by hammering on a mandril, so as to make the exterior of the tube all accurately of the same diameter. I was informed that there was a machine now designed to weld tubes up to six inches in diameter. The welding of angle and tee irons (especially into elbows or frames) has not yet been undertaken. I see no reason to doubt, however, that it can be successfully carried out. * * * *

"The most difficult operations which I saw carried on in the welder were the welding of steel wire rope cables and the welding of copper bars one inch in diameter. Messrs. Cooper, Hewitt & Co. (Trenton Iron Works) have taken up the manufacture in the States of patent 'locked wire' cable, the making of spliced joints in which is a matter of the greatest difficulty. The cable is to be used for tramways, etc., where it will pass over pulleys of large diameter. By cutting the ends square, and placing on them small iron rings to stiffen them, thoroughly good butt welds have been made in this cable, the rings being simply cut off after the weld is complete. I had some welds made in this way at Lynn on one of the ordinary welders in the shop, but a special cable welding plant has been constructed for Trenton, and is now being erected there. The weld makes the cable practically into a solid bar for a length of from 1 to 1½ inches."



CONSTANT POTENTIAL DYNAMO OF THE THOMSON ELECTRIC WELDING COMPANY.

In summing up his report, Mr. Kennedy says that the process "has been carried fairly beyond the experimental stage and has achieved sufficient success in regular commercial work of somewhat varied kinds to warrant the belief that its industrial future is one of the greatest practical importance."

The U. S. Naval Board, which convened at Boston February 10, 1890, under orders of the Secretary of the Navy, to investigate the process, have made an elaborate report, from which we glean the following points:

"We find that at the present time this process renders it possible, practically, to weld wrought iron, cast iron, brass and copper rods, from the size of the smallest electrical conductors in use for distributing purposes, to rods of 2½ inches in diameter, and to weld pipes of larger sizes; to weld dissimilar metals, and pieces of different forms of cross-section; to join by welding the ends of wire cables, and to form welded rings of small or large diameter. * * * * * * * * *

"We are convinced that the Thomson welding process can be found of

great utility to the naval service, both on shore and afloat, for the following reasons:

"It can be used—

(*a*) In welding breaks in rods without altering them either in length or shape.

(*b*) For welding tubes.

(*c*) For welding angles and shapes of intricate form.

(*d*) For welding copper, brass, cast iron or other metals.

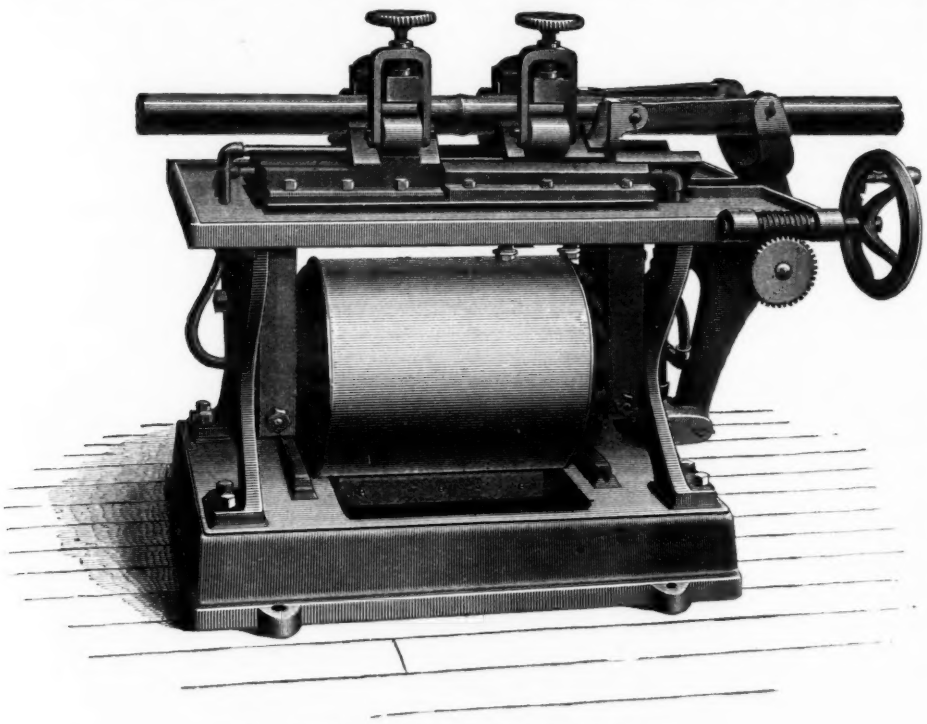
(*e*) For heating metals for forging, tempering and upsetting.

(*f*) For welding wire cables.

"Under these heads the following may be mentioned as a few of the many applications that would result on shipboard: for welding broken pump piston-rods, valve stems, etc.; for joining wires of iron, copper or other metals or bars of the same, of similar or different shapes or sections; for making joints at angles with bars (T or Y joints); for mending chain and wire rope; for constructing and joining end to end, pipe of all kinds, and of large or small diameter; working or joining lead pipe; welding T-connections or elbows into lines of piping; welding safe ends to boiler tubes; repairing boiler tubes; welding eye-rings, and welding these again to bolts or bars; repairing cutting and boring tools without hurting their temper; lengthening or shortening rods or bars; repairing broken cast iron pieces of machinery or broken cast iron or cast brass fittings; welding copper electric mains.

"This system of welding thus renders easy many operations in the working of metals which, with the forge and smith, have heretofore been considered impossible.

"It is the unanimous opinion of the Board that in the present day of



MACHINE FOR WELDING THREE-INCH PIPE.

ships constructed almost entirely of metals, and in which every fitting possible is made of metal, such a system as that which has been investigated by us becomes not only desirable, but a means to economy of expense, time and labor, and would add to the efficiency of the vessel under any condition of service.

"This system of welding occupies a position of its own; it is able to do not only a large part of the work of the forge now in use, but is capable of doing much work that was hitherto considered impossible. By its use, the large accumulation of now almost worthless boiler tubes stored at the navy yards could be made fit for service, and the quantity of spare tubes and of many other stores now carried by ships could be reduced."

Condition of the Bar Iron Market.

The mill men complain bitterly at the turn the market has taken. They say that upon the least advance in the price of bar iron, old rails jumped up $2 a ton, and that, having purchased their supplies in full confidence in the the stability of the market, they must submit to a reduction in the selling price of their product. Bar iron is quoted at $1.80, but sales below that figure are recorded.—[The Iron Trade Review.

Bar iron is a slender reed to lean upon. It is peculiar, too, in being elastic in only one direction, the downward trend; while in the upward direction it has a backbone of resistance equal to channel iron in actual use. It would not do for a mill to depend alone on common bar with any hope of steady profit for the owner; similarly, it is not the best basis for profits so far as the mill workers' wages are concerned.—[National Labor Tribune.

Personal.

Mr. Joseph R. Oldham, naval architect, consulting engineer and ship inspector, has opened an office in the Atwater building, Cleveland. Mr. Oldham's long experience, both abroad and in this country, render his services of unusual value.

"A Brief History of Feed-Water Purifiers" forms an interesting introductory chapter to the new catalogue of the Hoppes Manufacturing Co., of Springfield, O.

IRON AND THE TARIFF.

With an increase of only about one-seventh, or 1,000,000 tons, in the demand for pig iron in Great Britain, the price had been advanced in January more than 60 per cent. since February of last year, and to such figures that there were recently bids for American iron to be exported to England. Then came a slackening in the demand, and the price has fallen 14 shillings in less than one month, having risen 25 shillings in the previous eleven months.

This experience has its lessons for Americans. There are persons in this country, who control the action of one of the great political parties in and out of Congress, who propose that the duties on pig iron shall be removed. They reason that American consumers would thus secure cheaper raw materials. A year ago the price of Scotch warrants in England was about $10 per ton, so that, with freight and commissions paid, the iron could be delivered in this country at not more than $14 per ton; nor was this the lowest mark, for the year before the price had been $1 lower. But there are comparatively few furnaces in the United States which could compete with foreign iron deliverable at $14 a ton in Atlantic seaports, and it is far within the truth to say that furnaces yielding about half the American production, or 4,000,000 tons, would have to stop, if iron were selling at that price.

The Free Traders answer here, "The price could not be so low with an American demand to sustain the foreign market." But that is an evasion. The American demand would not exist nor influence the foreign market until American furnaces had been stopped. For the furnaces in this country are now producing at the rate of about 9,000,000 tons yearly, while the consumption here has never been as great. The British iron-masters would, at the outset, have to undersell American producers long enough to stop the production by many of them. With the powerful organization they possess, and the enormous stocks they have on hand, they could do this with ease, certain of an immense profit later. By selling, for a few months, at prices not lower than those made last year in February, the British makers could shut up at least half the furnaces of this country, and then could sell their iron at whatever price they please. The rise in January to more than 66 shillings per ton is only a faint indication of the advance which might, in that case, be effected, and with perfect impunity, for when an iron furnace has once gone out of blast, it cannot be started again immediately, and will not, unless the conditions promise some permanence of profit.

The result would be a peculiarly artificial market, in which the British iron makers would have all the advantage. They could control the price on both sides of the ocean. British manufacturers in league with them could buy largely at a period of sudden and temporary weakness, knowing that the price would advance whenever their demand had been supplied. They could effectually shut out competition of American manufacturers by putting up the price of raw iron at their convenience. With no certainty that the foreign price would be maintained, or would not at any time be intentionally depressed in order to accomplish their ruin, the American producers of pig iron would hardly venture to enter the unequal race. Higher prices than are now paid would probably rule most of the time Lower prices would be obtained only in spasmodic depressions, contrived to ruin American producers.

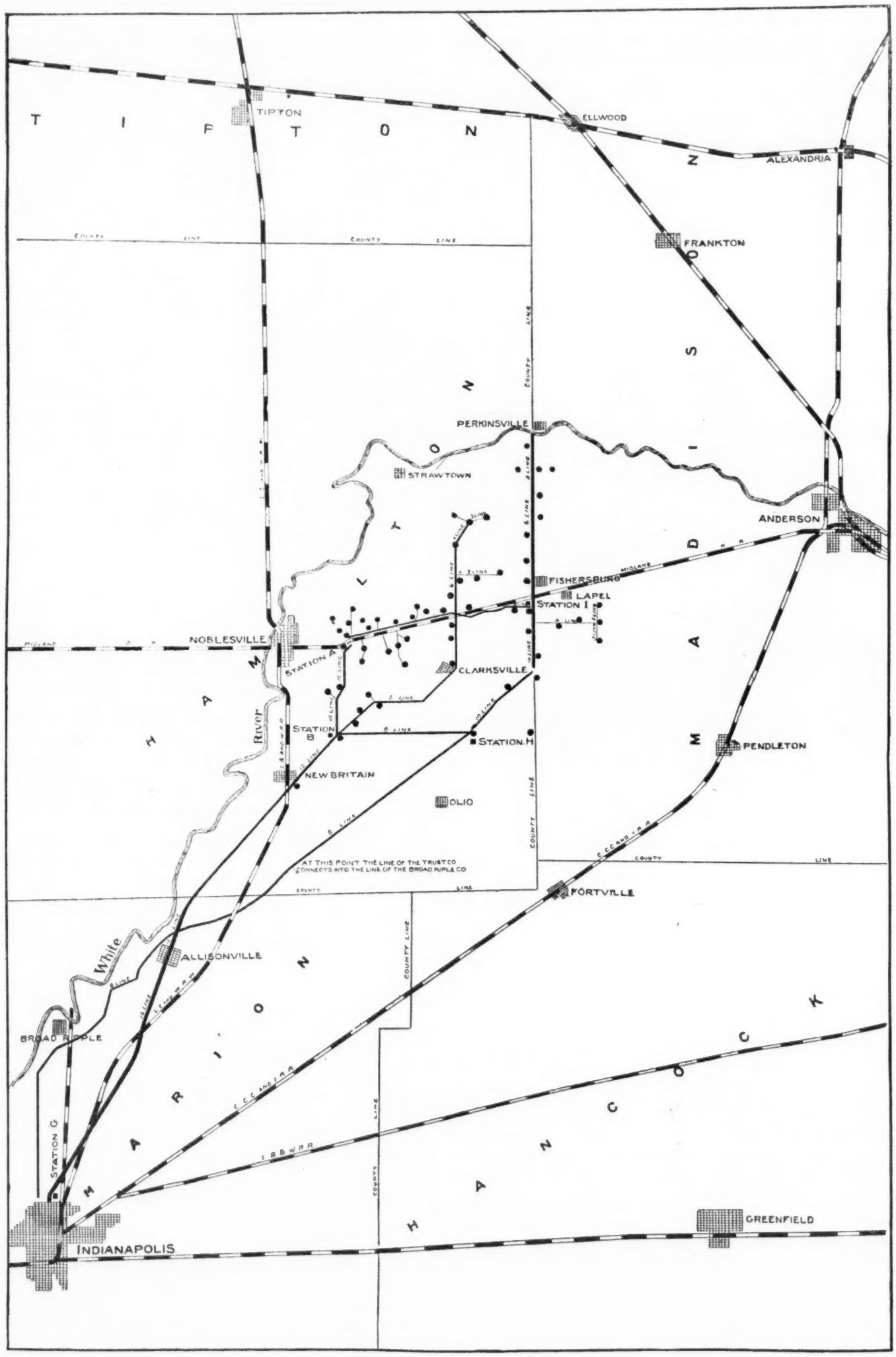
This is the Free Trade programme, to shut up American furnaces and bankrupt American manufacturers. It offers seductive hope of cheaper raw materials. In all probability it would force American consumers to pay more for their pig iron than they now do. If an increased demand of only 1,000,000 tons has enabled British makers to lift the price to about the present American level, an increased demand four or five times as great would put it into their power to exact far higher prices.—[New York Tribune.

A Portable Bridge.

M. Eiffel, of Eiffel Tower fame, has invented a form of bridge which will apparently be very useful in war, as a substitute for bridges that may have been destroyed, and in peace, for all kinds of temporary, as well as permanent purposes. The other day, within less than seventy hours, he erected one of his bridges 147 feet in length. It was entirely of steel, weighed 86 tons and proved itself capable of supporting a burden of over 200 tons. It would, therefore, have carried a railway train. In war time, the ability to restore a destroyed railway bridge in three days might make all the difference in the result of a campaign. M. Eiffel says that his bridge can be erected without machinery and by unskilled labor. Every piece of it is of a weight that can be easily placed in position by manual power, and the whole, when it leaves the factory, is so simply composed, and, in its parts, so clearly indicated, that an intelligent child, after having seen a plan of the completed structure, could superintend the erection of the bridge.

A Point Against Trusts.

Apropos of trusts, four curious facts—coincidences, shall we call them?—have to be recorded. During the past year the Salt Union in England raised the price of salt nearly 100 per cent. in some descriptions, and largely in all; the export trade in salt from Great Britain fell off about 25 per cent.; the dividend paid by the Salt Union was 10 per cent., instead of 20 per cent. as predicted in the prospectus when the dear public was admitted to a share in the benefits of the Trust. Fourth, the company of Brunner, Mond & Co., which controls such large salt interests that every effort was made, in vain, to secure its adhesion to the trust scheme, has just declared a dividend of 30 per cent. This last circumstance would seem to point the moral that it is better to remain outside of a trust than to join it.—[Engineering & Mining Journal.



THE CONSUMERS' GAS TRUST OF INDIANAPOLIS—ITS FIELD AND THE METHOD OF DISTRIBUTION.—(See opposite page.)

HOW INDIANA MANUFACTURERS OBTAIN NATURAL GAS.

Of the Consumers' Gas Trust Plant, of Indianapolis, which we illustrate herewith, as a specimen natural gas plant, we take from *Light, Heat and Power*, Philadelphia, the following description. To the courtesy of the same paper we are indebted for the use of the accompanying map.

Nothing like this Trust plant was ever devised in the West. Col Eli Lilly, Chairman of the committee on Leases and Gas Supply, has had charge of this outside work, and with Superintendent Shackelton and a competent force of engineers, has prepared the system as it is shown.

At the beginning of the year 1889, the gas territory of the company was practically confined to the area between the 10″ and 6″ pipe lines, which, diverging at Station B, 17½ miles from the city and 2½ miles southeast of Noblesville, reunite near the Coverdale Wells, 5½ miles east of Noblesville on the Midland Railway. There were a few wells north of Station A, at the angle of the 10″ line nearest Noblesville, and 4 wells north of Coverdale's. This comprised about 16 square miles of territory upon which 36 wells were drilled, with a measured open output of nearly 150,000,000′ of gas daily, and an estimated delivery to consumers in Indianapolis of 60,000,000′ in 12 hours. Under this heavy draft the pressure gradually declined over the whole field, some of the deeper wells showing water, and 4 wells became flooded so badly as to make it necessary to abandon them.

Experience showing the porous rock below to be continuous and connected in every direction, it became evident the field must be greatly extended in order to keep higher back pressures upon the wells and to prevent flooding. To this end, during the Spring and Summer of 1889, the lease holdings were rapidly extended east into Madison County and north in both Hamilton and Madison, until over 10,000 acres were leased systematically selected, so as to give favorable locations for drilling wells, over an area of about 200 square miles of undoubted gas territory.

The extension of the pipe system was then decided upon, locating the main 10′ pipe line directly on the county line between Hamilton and Madison Counties, from near Perkinsville, on White River, south 5 miles; thence southwest 3 miles to a point (now Station I) directly east from Station B. Thence an 8″ line was located to connect the 10″ at Station I, with the pipe center, Station B, and the old system still further connected with the new by an 8″ line from the head of the old 10″ at Coverdale's, east 2½ miles to the county line at Station H. Upon and near the lines so laid out the new wells were drilled, 27 being now completed, and additional wells being drilled at the rate of 1 well every 20 days.

Having acquired the Broad Ripple plant, it was determined to run an 8″ line from the foot of the 10″ at Station I, southwesterly 7½ miles to connect with the Ripple lines at a point near the Marion County line, thus giving us 2 independent lines from the fields to the city. The Broad Ripple wells, being small, wet and of little use, are not considered as a source of supply, or shown in the map.

The company has drilled, therefore, 63 wells altogether, of which it has lost 4 by flooding, and others, showing little or no gas, have never been used, leaving 55 wells now in use, against 31 wells, the greatest number in use last Winter. The new wells average very much larger than the old wells, so that a low estimate of the open output of the 55 wells would now be 350,000,000′ daily, with a maximum delivery in Indianapolis of 90,000,000′ in 12 hours. So it occurs that with the pipe extension, completed this Winter, consisting of 8 miles of 10″ pipe line, 15 miles of 8,″ 2 miles of 6,″ 5 miles of 4″ and 4 miles of 3,″ making a total of 34 miles of main lines and connections, the company is drawing its gas supply from a total area of about 60 square miles of territory, against 16 square miles last Winter, with a greatly improved range of pressures over the entire field.

An exeedingly important feature of the field plant is the connection of the old and new fields by the two 8″ cross-lines. There being a thorough circulation of the gas in the porous rock beneath, the gas rushing from one point to another to fill the partial vacuum caused by the output of the wells; so, also, by the present arrangement, is the circulation in the pipe system directed toward the point of greatest exhaustion, thus rapidly restoring the equilibrium and causing a very uniform back-pressure on the wells and uniform working of the entire field. Again, the system allows any one of the 3 upper field lines to be shut out for repairs, if necessary, and the other 2 lines will supply both the main lines with sufficient gas for all ordinary demand. It will in this connection be noticed that the 3 field lines have a greater aggregate area than the 2 main lines by the proportion of 236 to 208; therefore, the pipeage above Station B and I will bring more gas to those points than the 2 main lines will bring down.

Station B is called the pipe center, being headquarters in the field. All the lines center there and are controlled by valves. There is a comfortable house fitted with every requisite for handling the gas and making line repairs. Two men are constantly on duty here. Stations A, H and I are minor valve stations, and there are also valves directly in each pipe line at intervals, so that, in case of accident, any part of the line may be turned out for repairs. The lines are inspected daily by the line-walkers, who occupy the field stations at night, the whole force being directed and the gas handled by telephone orders from the main office in the city, which is connected by the company's private wires with all the stations on the main lines at Allisonville, Fisher's and New Britain.

Steel Cars for the Iron Ore Trade.

The use of steel cars in ore traffic is being considered, more or less seriously, by some of the railroads in this section of the country. The use of steel cars for that kind of service would give the railroad taking such a step a good opportunity to watch the cars closely and see the results of continued service. Running, as they generally do, between two given points, repairs could be made without serious inconvenience. A special line of service presents several features which would make it comparatively easy to give the steel car a good test. For the construction of ore cars, steel would seem to be especially suitable. Whether the present interest in the subject will lead to the building of any steel cars, it is not easy to prophecy, but one road has considered the matter seriously enough to ask for bids and the time of earliest possible delivery.—[Railway Review.

THE GROWTH OF THE OHIO NATURAL GAS INDUSTRY IN 1889.

From a recent paper by Professor Edward Orton, in the *American Manufacturer*, we take the following:

Returning to the main fields, which have been already named, we find that the use of gas has probably been more than doubled in 1889. Manufactures, based on a cheap and abundant supply, have been greatly multiplied at all the leading centers, but, more than all, new towns have been attached to the fields by the dozen. Leaving out of the account a large number of villages contiguous to the gas fields, of less than 1,000 population, many of which now avail themselves of the pipe lines, that are laid through their streets on the way to larger markets, we find that 1889 has given the great boon of Trenton limestone gas to these among other Ohio towns, viz.: Dayton, Springfield, Greenville, Wapakoneta, Van Wert, Delphos, Sandusky and Bellevue. Findlay, Lima, Bowling Green, Fostoria, Fremont, Tiffin, Carey, Kenton, St. Mary's, Troy, Piqua, Sidney, Celina and other towns had been previously supplied. The Northwestern Ohio Gas Co. has also laid a large line to the Michigan boundary, designed to furnish domestic fuel to Detroit.

It will be seen from these lists that Trenton limestone gas has more than doubled its possible constituency during the last year.

In the way of utilization in manufactures, the increase has been equally marked. Findlay now has 154 glass pots, nearly half of them added in 1889. A large volume of manufacturing interests has also been brought in. An equal, or, at least, a similar enlargement, has gone forward in Tiffin and Fremont. Fostoria is also well to the front in this remarkable expansion. Bowling Green has also made some noteworthy advances.

Fostoria and Tiffin both own pipe lines to the great gas fields, built by public funds. The gas that they obtain from wells of their own drilling, on lands that they have leased for this purpose, they turn over, at either nominal or very low rates, to the manufacturing companies, counting on the growth of the town for their returns. The gas furnished on these terms is naturally used in a lavish way.

Toledo is supplied by two pipe lines, owned by the Northwestern Ohio Co., and in addition the city is preparing, at great outlay of funds, to be raised by bonding the town, to build a line for itself from the Hancock county field, where it has leased gas lands and drilled wells on a large scale.

Space will not avail for the detailed history of this remarkable growth, but attention must be called to a few striking facts before closing:

(1) The largest gas wells yet struck in Ohio belong to the last year, one of them to a very recent date. The Mellott well, near Stuartsville, six miles north of Findlay, has an open pressure in the casing of 28 pounds. This stands for a daily production of about 28,000,000′. A new well recently drilled by the Northwestern Co., near Bairdstown, Wood county, is reported to have shown the amazing open pressure of 45 pounds in the casing. This stands for about 33,000,000′ per day. The Karg well was long counted the wonder of the world. Its daily volume at its best was about 14,000,000′.

(2) While individual wells of greater volume than any one has even dreamed of hitherto are being brought in, the field as a whole, is steadily losing pressure. The portions of it that were first opened are in several conspicuous cases nearing exhaustion. No intelligent observer at the present time talks of inexhaustible supplies.

(3) The fact is becoming apparent to many that when the gas field is found dead, and an inquest is held upon it, the verdict will be that it died by drowning. Salt water seems bound to extinguish at last its precious flame.

Iron Manufacture on the Michigan Peninsula.

Now that the condition of the iron market warrants manufacturing on the peninsula, and prospects appear to be such as to hold the market firm for an indefinite period, the old furnaces on the peninsula that have lain idle for many years are being gotten in readiness for active work. The Carp River furnace at Marquette has gone into blast; the Excelsior at Ishpeming is undergowing repairs with a view to putting it into blast soon, and a furnace will also be built at Marquette the coming Summer. Eastern manufacturers claim they can import ore from foreign markets at less cost than Lake Superior ore can be furnished them at present prices. The time is not far distant when a very slight percentage of the ore mined will be shipped from the peninsula in the raw state; it will be manufactured here, and when that day comes the Eastern furnace-man and manufacturer will find ample opportunity to hunt for foreign fields.—[L'Anse (Mich.) Sentinel.

American Machinery Engraving.

The engravings in American technical journals are all the time improving, while those in foreign journals, the English at least, are running down to the point of shabbiness. Whether it is the price, or want of skill does not appear, but in the late issues of the *Engineer*, *Engineering* and some other papers, there are engravings such as have never appeared in this journal. Those made in France are a caricature on the art, and it is a wonder our English friends do not make them over again before publishing them. The remark does not, so far as we know, apply to German work, indeed, a good many of the best engravings in English technical journals are made in Germany. A cheap, rough engraving is dear at any price, or at no price, because people in comparing for trade purposes, judge of skill in the article itself by the skill shown in representing it.—[Industry.

BARNES NEW SENSITIVE DRILL.

The sharp competition existing between manufacturers in all lines of metal work makes it necessary for them to employ only the most perfect tools and machinery in order to produce their goods to the best possible advantage. This demand for improved machinery has stimulated the inventive faculties of our mechanics and engineers, with the result that new machines are being produced, which, considered in relation to their special adaptation for the purposes for which they were designed, are almost absolutely perfect.

As a case in point, attention is called to the new sensitive drill, made by the well known house of W. F. & John Barnes Co., No. 14 Ruby street, Rockford, Ill. The drill is shown by the accompanying cut, and it will at once be seen that the principles involved in its construction mark a radical departure from other tools of this kind heretofore made. There is a constantly increasing demand for such a drill, and it is eminently adapted for use in the manufacture of electrical appliances, builders' and cabinet hardware, and in general where the drilling is not large, but where delicate adjustment and rapid and effective operation are essential. It is in the strictest sense of the word a sensitive drill, for the variations of speed and power are so completely under the control of the operator, and the adjustments so perfect, that the person using the drill is always able to determine the pressure which is being applied. Herein lies the economy of this new tool in the preventing of the breakage o twist drills. To any one familiar with the subject it is hardly necessary to

refer to the great waste in the breaking of small twist drills when used with the ordinary drill press.

When it is further considered that all the adjustments of power and speed can be made instantly without shifting belts or stopping the machine, the manufacturers' claim that the drill is far ahead of any other sensitive drill made seems to be well founded.

The following description from the company's catalogue gives additional particulars regarding the construction of the drill, its dimensions and capacity:

"The speed of the drill spindle can be increased or diminished instantly, or the motion reversed, without stopping the machine or shifting belts. More or less driving power can be applied to the drill spindle, as the size of the drills or the nature of the work may demand. The feed lever is provided with a very sensitive adjustment, which, with the perfect control of the operator over the speed and power, makes it possible to use the smallest drills, with the least possible danger of breakage. By a hand screw, within convenient reach, the platen or table can be moved rapidly on the column, and can be clamped firmly at any desired height.

"The workmanship throughout is first class, and the material used the best for the purpose. All bearings and wearing surfaces are especially fitted for durability, and ample provision is made for taking up wear. We claim, therefore, for this drill, superiority both in simplicity of construction, which renders it less liable to derangement, and in effectiveness of operation on account of the variations of speed and power being so completely under the control of the operator, whereby all the adjustments are made with the least possible loss of time. It is smooth and almost noiseless in operation, and entirely free from the vibratory motion commonly found in drills of this class, where the spindle is driven by belt. For all the uses for which a sensitive drill is required, we believe ours to be unequaled.

"Capacity and dimensions.—It will drill from 0 to 5-16 inches, and to center of 10-inch circle. Greatest height from base of drill to spindle, 46 inches, greatest height from platen to spindle, 36 inches; distance from column to spindle, 5 inches; diameter of column, 3½ inches; diameter of spindle, ¾-inch; size of table, 10x14 inches; vertical motion of spindle, 3½ inches; tight and loose pulleys, 5x2 inches. Speed, 0 to 1,600 revolutions. Weight, 170 pounds."

Spanish Iron Famine.

The London journal, *Money*, states that, according to *Bilbao Maritimo y Comercial*, shipments of hematite ore for the current year have been the largest on record, the quantity exported up to date having been 450,000 tons, which is about 3,500 tons more than the previous highest record. The price of the mineral remains very firm, Rubio being quoted at 10s. and Campanil at 12s., with a very good demand and short supply, especially of the latter brand, which is very difficult to procure, even at the high price quoted. Our contemporary remarks that so great has been the demand since the beginning of the new year that the depots of mineral are almost exhausted—so much so that at the time of writing there were no less than 120 steamers anchored in the port waiting for cargoes, and many of these ships were delayed at the loading stations an indefinite time, owing to the scarcity of mineral. It was computed that there were ships in the port capable of loading 185,000 tons of iron ore, if it could be found to load them with, and that never before had such a concourse of steamers been seen anchored in the Bilbao river. The exports of Spanish ore to Great Britain last year were close upon 3,620,000 tons, compared with 3,230,000 tons in 1888. Its market value was more than £2,607,000, and was paid chiefly to English companies owning Spanish iron mines. Besides this the cost of freight for bringing the ore to English ports amounted to £450,000 or £500,000, and was earned principally by English ship-owners trading to the Biscayan ports with coal, and taking iron ore as a return cargo.

The Use of Steel Pipes.

Steel pipes as a substitute for cast iron now form an important item for the engineer's consideration in Transvaal works, inasmuch as during the past year the transport from Kimberley to Johannesburg, a distance of only 300 miles, cost not less than £30 per ton at the time of the drought, and even in good seasons the cost of transport per ton is as much as from £12 to £15, consequently any substitute for the heavy cast iron pipes is a desideratum. Steel pipes are being adopted because they are only about one-quarter of the weight of cast iron pipes of the same internal diameter, and they are less liable to fracture than cast iron. For the water supply of the city of Pretoria, Messrs. James Russell & Sons, of Wednesbury, have obtained the contract for manufacturing some twenty-seven miles of steel pipe for this particular supply. The same firm supplied the pipes, or a portion of them, for the Kimberley Water works in Cape Colony, which have done good service. The consulting engineers for the Pretoria water works are Messrs. E. Pritchard & Co., who are also the engineers for the proposed scheme for the supply of water to Johannesburg and neighboring gold mines, where over 4,000 tons of pipes will be required, as well as for the water supply of Klerksdorp, another prosperous town near to Potchefstroom, and second only to Johannesburg.—[The Engineer (London).

A Big Shipment of Machinery.

The immense armor plate bending machine made by the Niles Tool Works, Hamilton, O., for the navy yard at Mare Island, Cal., was shipped March 16, over the Cincinnati, Hamilton & Dayton and Southern Pacific railroads. The machine was loaded upon eleven specially built and extra heavy flat cars. The two largest castings weigh, respectively, 66,400 and 66,200 pounds, and the gross weight of the train was 675,350 pounds. This train will be run through the entire distance, 3,400 miles, without change, the distance being greater than the entire system of the Canadian Pacific. The railroad company will not attempt to make fast time, owing to the great weight of the castings, but will turn it over to the Government April 1. The whole train will be run on a special boat at San Francisco and taken up the Sacramento river, forty miles, to the island. The freight, which was prepaid by the Niles Tool Works, amounted to a little more than $10,000. This is the longest distance any solid freight train ever traveled, and it is the largest shipment of one single machine ever made in the United States.

A New Method of Melting Iron.

A German inventor proposes a new method of melting iron, the advantages claimed for which are economy in fuel, greater facility for making sharp, strong castings, and a purer description of metal. The cupola is supplied with blasts through two tuyeres, one above the other, there being 18 in each set, the tuyeres being ports, with the form of a vertical slat, and directly connected with a tuyere ring. The special feature of the cupola is that the bottom is a slightly inverted arch, pierced by two openings, through which both blasts, or, rather, imperfectly consumed gases of combustion and the fluid can flow. Below is a small chamber in which the iron collects. It is heated by gases forced down from the cupola above, those being supplied with the necessary air for combustion by a special tuyere leading to the main pipe, the chamber at the same time serving to preheat scrap, etc., which needs only to be pushed into the bath for dissolving it.—[Exchange.

AN ornamental reminder of the manufacturing house of Merchant & Co., Philadelphia and Chicago, dealers in the best guaranteed tin plates for roofers, comes to us in the form of a brass pen, full size, designed for use as a letter opener. It is a handsome acquisition to any business office.

AMONG THE IRON MINES.

Canadian Iron Ore.

The North Lake Mineral Land Co. in 1887 took up sixteen locations on Gunflint Lake. The men who compose this company are old mining men, largely interested in mines of the Marquette region. They only took up these Canadian lands after making a careful examination of them. The samples shown in the *Herald* make an average of 66 per cent. of Bessemer ore. The locations line along Gunflint and North Lakes, adjoining Mr. Paulison's lands. The P. A., D. & W. railway will run through both lots of locations. The beds have not yet been thoroughly tested. On the north and west side, the iron formation lies up against the chloritic schists, while farther back the black slate formation again comes in, so that back of the iron deposits will be found silver.—[Port Arthur Herald, Feb. 15.

Iron Ore on Staten Island.

It may not be generally known that there are deposits of brown hematite (limonite) on Staten Island, Richmond County, N. Y. The principal openings are the New Dorp, the Towle and the Cooper & Hewitt mines, Middletown, and Tyson's mine, Castleton. These mines are all in the northeastern part of the Island. They have been idle for about ten years. Some of the deposits were worked early in the century. Dr. N. L. Britton estimates the total production at 250,000 tons up to the time when the work was suspended. Although the nearest iron mines to New York City they, like the mines of the lower Hudson River, are at a disadvantage in being distant from furnaces and fuel. The ore lies upon serpentine or talcose rocks, is generally covered by glacial drift, and ranges up to 12 feet in thickness. It contains a notable quantity of chromium.—[Engineering & Mining Journal.

Great Times for the Gogebic Range.

Upwards of ten thousand men to-day are working in the mines and locations of the Gogebic and Penokee ranges, opening up inestimable wealth in iron. The prospecting and development work of the past six or eight months has opened up a number of very promising mines, and many of them will undoubtedly be big shippers during the coming season. Nearly two million tons of iron ore were shipped at the port of Ashland last year, and as much more by rail and from other ports. The work of development has been pushed forward with the greatest alacrity during the Winter months, and in some of the mines many thousands of tons of ore are reported to be uncovered. With the entire possible output of many of the mines for the season of 1890 already disposed of, the outlook for substantial dividends for the fortunate stockholders, and the correspondingly fortunate miners who find employment in removing the mineral from the hiding depths, is assured. The Norrie mine alone will put put out over 700,000 tons of the raw material during the coming season, while the Ashland, Colby, Pabst, Aurora, Palms, Germania and other large properties will make heavier shipments this year than at any previous period in their history.—[Inter-State News, Ironwood, Mich.

New Discoveries on the Vermilion and Mesabi Ranges.

The riches of the Northern iron ranges are still practically unknown, and every year sees new fields for the prospector and miner opened in the Vermilion and Mesabi ranges, and the predictions of such well-posted geologists as Professor Winchell, of iron experts and of Duluth newspapers that these ranges have the greatest bodies of ore known on this continent, are fast being proven the truth. Of late, most of the work and development of which people have known through the columns of the newspapers, or in other ways, have been in what is called, for convenience, the East part of the district—the iron land east of Tower and Ely, on the Vermilion, and east of the crossing of the Iron Range road, on the Mesabi, and in the far western end of the Mesabi, where the Diamond Company has opened a number of shafts near the Prairie river; where, also, other mine owners of Duluth are preparing to develop their lands, on which valuable deposits are believed to exist. But, for several months, explorers have been vigorously pushing operations west of Tower, and town 60-18 has been particularly favored with their presence, though 59-19, 59-20, 58-20 and 58-21 have also been gone over and rich indications of valuable ore bodies found in all. Just at present a force of men is at work in 60-18 and the ore there is found to be a soft hematite, much like that of the Chandler and other mines of the East range. As soon as Spring opens, one or two diamond drills will be put to work in this township, and others near by, and an actual knowlege of the ore and the extent of the deposits will be made.—[Duluth Herald.

A New and Powerful Mining Company.

Articles of incorporation of the Minnesota Mining Co. have been forwarded to St. Paul for the proper recording, and have been filed here with the register of deeds. The capital stock is stated to be $600,000, with a limit of indebtedness fixed at $1,000,000. The first board of directors is composed of the following well-known names. Besides these names the company is composed of several men whose names can not appear, but who are heavy stockholders, and who are quoted among the millionaires of the country outside of Minnesota: C. A. Severance and F. B. Kellogg, of St. Paul; H. B. Moore and W. T. Bailey, of Duluth, and W. B. Parsons, of Dodge Center. The general offices and headquarters will be maintained in Duluth. The central section of land leased by the company is the famous section 16-62-14, and a total of 960 acres comprises the lease-holding. Of section 16 alone, several well-known iron experts have declared it to be the richest in Bessemer ores in the State, one going so far as to remark that "there is enough Bessemer ore in that section to warrant the building of a railroad from there to Duluth for its ore alone." The Duluth & Iron Range Railroad already runs through a portion of the lease-holdings, and additional tracks will be laid to reach the properties as soon as the snow clears away. It requires but three-quarters of a mile of spur track to reach the famous section 16. The work of developing the property will commence in about a month, and while the *Herald* scarcely thinks the estimate of 300,000 tons will be reached as this year's production, the new mine will make a most favorable showing.—[Duluth Herald.

TEMPERED COPPER BOXES AND BEARINGS.

Copper is well known to be the basis of nearly all anti-friction metals. It, however, lacks the strength in its natural state for bearings, and must be hardened by amalgamating with tin and other metals, to give it the required strength and hardness. Such mixtures change the whole nature of the copper, leaving it a granular and brittle metal with a hard grinding surface, instead of a tough, fibrous metal. That copper was hardened or tempered by the ancients, no one can doubt, as samples of edged tools and relics of all kinds have been found, composed of pure copper, and are on exhibition in all collections. It is interesting, therefore, to learn that the Eureka Tempered Copper Co., of North East, Pa., claims to have discovered this process and to be able to supply the trade with any and all kinds of copper cast solid, tempered to any gauge that the work expected of them demands. To meet the increased demand, they have enlarged and perfected their facilities for its manufacture, and are now prepared to fill all orders promptly, either large or small.

Among the uses to which tempered copper can be put are: Locomotive and railroad bearings, engine boxes, (high or low speed) gears, pinions, gibs, rolling mill boxes, mill steps, springs of all kinds, roll plate for boiler plates, all kinds of journal bearings, loose pulleys, friction clutches, carriage axles and boxes, street car boxes, steam pumps and valves, pump linings, rider brasses, commutator strips or bars, electric brushes, dynamo shells, bearing boxes for electric motors and dynamos, trolley wheels, electric switches or cutouts.

The following records of recent tests of tempered copper are very interesting. The first is a series conducted by the G. W. Ferris & Co., Civil Engineers, Pittsburgh, tested on a 200,000-lb machine at Carnegie, Phipps & Co.'s Homestead Steel Works: Original dimension, .249 of one inch or ¼ inch wire. Fractural dimensions—tempered copper No. 1 sample, .145; tempered copper No. 2 sample, .180; ordinary copper No. 3 sample, .126. Actual load—tempered copper No. 1 sample, 3,140 lbs.; tempered copper No. 2 sample, 3,140 lbs.; ordinary copper No. 3 sample, 1,146 lbs. No. lbs. to sq. inch—tempered copper No. 1 sample, 64,480 lbs.; tempered copper No. 2 sample, 64,480 lbs.; ordinary copper No. 3, sample 23,530 lbs. Extension in 1 inch—tempered copper No. 1 sample, .20 or 20 per cent. full cup; tempered copper No. 2 sample, .15 or 15 per cent. angular cup; ordinary copper No. 3 sample, .63 or 63 per cent, ½ cup. Extension in 8 inches—tempered copper No. 1 sample, .240 or 3 per cent. full cup; tempered copper No. 2 sample, .20 or 25 per cent. angular cup; ordinary copper No. 3 sample, .46 or 43.25 per cent. ½ cup.

Dr. F. A. Genth, Philadelphia, made tests in his chemical laboratory, with the following results:

	1. Pig Copper. Per cent.	2. Edge Pieces. Per cent.	3. Castings. Per cent.
Silver	0.056	0.053	0.095
Copper	99.892	99.961	99.914
Tin	trace	0.045	0.094
Lead	trace	trace	trace
Iron	0.056	0.069	0.056
	100.042	100.128	100.159

The Electro-dynamic Co., of Philadelphia, writes: "It is with much pleasure that we are able to state that we have used about one thousand pieces of your tempered copper, with entire satisfaction. We have found the metal to be of uniform hardness and entirely free from flaws or blow-holes. As cast copper, we regard it as a superior article."

Engine No. 6 on the Buffalo, Rochester & Pittsburgh Railroad was fitted out with boxes of tempered copper by the above firm, and after a service of six months they were examined by the officers of the road and, upon examination, did not show any wear. This same thing is true of several railroads who have tried this metal.

The Pittsburgh Reduction Co., manufacturers of pure aluminum, Pittsburgh, make the following statement: "The statement made in your letter of December 11 is perfectly satisfactory to us, and we trust you will be able to treat our aluminum in the same way that you have so finely done with your copper. In this connection, let us state that we have one of your tempered copper commutators in one of our dynamos, which is now in competition with an aluminum bronze commutator. The two have been running over four times as long as the ordinary commutator would run, without having to be dressed up. The two are running about alike as to quality; and as we know aluminum bronze to be one of the toughest metals possible to obtain, it speaks wells for your tempering process. We would be glad to certify to its advantage to any one you may wish, and only hope it will be possible to temper aluminum in the same way. The subject is worth your careful consideration."

The Largest Steel Flume.

According to a press telegram, "negotiations have been completed and a contract has been let for the building of the longest and largest steel flume in the country. It will be built by a company of Spokane capitalists, which has been incorporated under the name of the Spokane Hydraulic Mining Co. The flume will be an immense steel pipe four and one-half miles long, carrying water from the old California ditch, at the head of Pritchard creek, in the Cœur d'Alene mining district, above Murray, to the Old Wash gold diggings. When the flume is completed, it will be one of the greatest feats of hydraulic mining engineering ever attempted. The flume will be made of heavy steel pipe, 22 inches in diameter. It will give a tremendous pressure and will reopen some of the old placer mines, which are the richest in the Cœur d'Alene."

INDUSTRIAL SUMMARY.

New Enterprises :—

The Bel Air (Md.) Water & Light Co. has been incorporated.

The Crescent Planing Mill Co. has been formed at St. Louis, Mo.; capital stock, $50,000.

The Quaker City Mining Co., of Carthage, Mo., has been incorporated, with a capital of $50,000. The incorporators are H. P. During and C. F. Maxwell.

The Bessemer Gas & Electric Light Co., of Pueblo, Col., has been incorporated, with a capital stock of $100,000; incorporators, J. A. Dempsey, Rees Jones and H. Fritch.

The franchise for a water works plant, at Huntington, Ind., has been granted to a company of local capitalists, and the work of construction will begin early in the Spring.

The Natchitoches (La.) Cane River Bridge Co. has been organized, with David Pearson as president, to build the toll bridge over the Cane river at Natchitoches. It is to have two iron spans, 120 and 140 feet long, with a 75-foot draw.

The Leavenworth Electric Light Co., of Leavenworth, Kan., is a new corporation, with a capital stock of $100,000; directors, Edward Carroll, McCum Hunt, Paul E. Haines and John Gimpes, of Leavenworth, and E. Hennings, of Chicago.

The Rapid Transit Bridge Co. has applied for a charter, at Pittsburgh, Pa., to build a bridge over the Allegheny, at Allegheny, Pa.; capital stock, $10,000; directors, W. J. Crawford, F. A. Rinehart, J. H. Danks, F. J. Lener and Robert Simpson.

It is stated that capitalists from Philadelphia and Reading have been to New Florence, Westmoreland county, Pa., and have decided to erect a steel plant there. The works are to be large, and a high grade of steel is to be manufactured.

H. W. Rinckley & J. F. James, of Reading, Pa., have leased the old Pott foundry, at Pottsville, Pa., and have commenced the manufacture of galvanized iron and copper cornices. The works will be known as the Pottsville Cornice Works.

The New South Mining & Manufacturing Co., of Atchison, Kan., has been chartered; directors, David Kelsoe, Parsons; N. M. Beatty, Springfield, Mo.; B. P. Waggoner, Wm. P. Waggoner, Atchison; Neal Dodd, Gallville, Ark. Capital stock, $2,000,000.

The Water Works Committee of the Board of Public Improvements of St. Louis, Mo., will soon advertise for bids for low-service engines at the new pumping station at that city. The engines are to have a capacity of 20,000,000 gallons per day each.

Akron, O., is having a boom in new manufacturing concerns, a late one being the Drop Hammer Forging Co., for the manufacture of farming implements. Joseph Cook is president; F. M. Belden, vice-president; J. D. James, secretary and treasurer.

The Steelton Water Co. has been granted a charter for the purpose of supplying water to the public at Steelton, Pa.; capital stock, $50,000; incorporators, Robert L. Bloomfield and William S. Stinger, of Philadelphia, and James P. Herdic, of Williamsport, Pa.

The Mercantile Iron Mill Co. has been organized at Trinidad, Col., to operate the rolling mill recently built at Trinidad by the Trinidad Rolling Mills & Iron Co., with a capital stock of $68,000, by J. A. Lindsay, John Grass, Sol. H. Jaffa, M. Lerhart and H. F. Moore.

The following articles of incorporation have been filed with the Secretary of State, at Columbus: The Schuler Manufacturing Co, Cleveland; incorporators, Charles Schuler, G. A. Steinbrenner, Oscar V. Hensley, Capell L. Weems and R. D. Updegraff; capital stock, $10,000—The Huron Dock Co., Cleveland; incorporators, Earl W. Oglebay, Leonard B. Miller, Henry S. Sherman, Aton C. Dustin and Clifford A. Neff; capital stock, $100,000.

At a meeting of the citizens of Warre, Mass., it was decided to buy the plot of land opposite the Boston & Albany station at an expense of $40,000, and to erect buildings thereon suitable for electric light and steam power plants, iron foundry and machine shops. One of the machine shops is to cost $10,000, and, as soon as completed, will be occupied by J.F.Porter, of Hatfield, manufacturer of lathes.—[American Machinist.

The entire malleable iron plant of the St. Louis Malleable Iron Co., which suspended operation about a year ago, consisting of furnaces, cupolas, machinery, shafting, engines, boilers, etc., has been purchased by the Stark Mfg. Co., of St Louis, says *Iron Age*, who will utilize the premises in the manner originally intended, and will also make a newly patented nut-lock, and yokes used in the conduits on the cable roads. The establishment will give employment to over 300 men at the start. Frank G. Stark, Richard E. Perry and T. A. Russell are directors.

The business people of Bellevernon, Pa., are exulting over the prospect of the location of a large iron mill and other smaller manufacturing plants at that place. For some months past, and especially since the location of the mammoth plate glass works at Charleroi, two miles away, representatives of eastern capitalists have been looking about within the Bellevernon gas field for advantageous locations for manufacturing plants. S. F. Jones & Co., a banking firm, who own a large farm on the outskirts of town, offer 12 acres as a site for an iron works, which, it is said, has been accepted. The works will be quite extensive, giving employment to from 400 to 500 persons.—[Connellsville (Pa) Courier.

Recent Illinois incorporations: F. Conda Heating Co., Chicago, to manufacture house-heating apparatus; capital, $5,000; incorporators, C. B. Cobb, E. J. Yunker and G. B. Cobb, Jr.—World's Fair Tower & Observatory Co, Chicago, to erect iron towers on the grounds of the World's Fair, to be held in Chicago, for the pleasure and observation of visitors to the fair; capital, $250,000; incorporators, S. H. Whitsitt, P. J. Donbey and D. W. Medbury.—Rotary Machine Co, Chicago, to do a machine business; capital, $75,000; incorporators, F. B. Dysche, C. J. Wood, E. A. Martilear.—Mexican Railway Development Co., Chicago, to construct and equip railways; capital, $100,000; incorporators, M. Masterson, W. O. Robinson and W. B. Wilson.—Phœnix Metal Co., Chicago, to smelt, refine and manufacture all kinds of ores and metals; capital, $250,000; incorporators, John E. Enright, Jr., A. H. Watson and Robert Locke.—S. B. Dover Manufacturing Co., Chicago, to carry on a general machine shop and manufacturing business, capital, $5,000; incorporators, S. B. Dover, Ludwig Bird and William Hindorff.—Weyburn Special Machine Co., Chicago, to do a manufacturing business; capital, $10,000; incorporators, F. Weyburn, E. E. Lockwood and M. Lockwood.—Baker House Heating Co., Chicago, to devise apparatus for heating and ventilating railway cars; capital, $100,000; W. C. Baker, George M. Sargent, Charles M. Hewitt.—Baker Car Heater Co., Chicago; object, capital and incorporators same as above.—Smoke Preventing Furnace & Boiler Co., Chicago; object, capital and incorporators same as above.—Railway Device Manufacturing Co., Chicago, to manufacture devices for improvement of railways; capital, $100,000; incorporators, T. W. McElwain, E. N. Clifford, Julian Kune.—Buena Vista Gold Mining & Milling Co., Chicago; capital, $100,000; incorporators, P. L. Hanscom, H. H. Barney, F. S. Baker.—Sectional Safety Boiler Co., Chicago, for heating purposes; capital, $100,000; incorporators, W. C. Baker, George M. Sargent, Charles M. Hewitt.—Burns Copper Welding & Manufacturing Co., Chicago, for welding and manufacture of copper, iron, steel and other metals; capital, $500,000; incorporators, W. J. McKeever, James Murphy, Charles Magin.

Enlargements, Additions, Removals, Etc.:—

The Brownell & Wight Car Co., St.. Louis, Mo., will build new and greatly enlarged works.

The Northwestern Expanded Metal Co., Chicago, has filed certificate of increase of capital to $100,000.

The Wayne Agricultural Works Co., of Goldsboro, N. C., will rebuild its foundry which was recently burned.

The Stewart Iron Fence & Ornamental Co., Witchita, Kan., are said to be contemplating removal to Houston or Dallas, Tex.

The Mather Electric Co. will enlarge its factory, at Manchester, Conn., to about double its present capacity. The new building will be erected across the end of the present structure, at right angles with it. It will be 250x60 feet, and three stories high.

J. P. Witherow, of Witherow's Works, New Castle, Pa., in a recent talk with a reporter, said: "We propose to enlarge our machine shop by extending the new shop back to the foundry; will also erect a large iron building in front of the boiler shop, which will afford sufficient shelter to the large force of men we always keep working outside, on account of the crowded condition of the main shop, and will also make considerable improvements in the way of new machinery and other things."

A press dispatch of March 18, says: Two of Findlay's (O.) most extensive manufacturing plants changed hands this afternoon. The Carrothers Rolling Mill was disposed of at master commissioner's sale. There were but two bidders, George M. Bard, of Cleveland, who offered $12,000, being a two-thirds appraisement. A. L. Wetherold raised the bid to $18,000, the full appraisement, and the property was knocked down to him. V. H. Coons, master commissioner, sold the works of the American Nail & Machine Co., which were appraised at $31,300. P. F. Good, president of the company, secured the plant at a bid of $28,000. The works will be managed by a reorganized company.

Fires and Accidents :—

Joliet, Ill.—On March 8th the foundry and buildings of the Joliet Iron & Brass Works, and the Joliet Castor Co., were destroyed by fire.

Hopkins, Minn.—The works of the Northwestern Wood & Iron Co. were burned recently. The loss was $10,000. Bright Bros. were the owners.

Cleveland, O.—A fire at the Eberhard Manufacturing Co.'s works, March 9, destroyed three brick buildings containing the roll, trying and repair departments. About 1,000 men are thrown out of employment.

Cleveland, O.—The pattern shop of T. N. Brooks & Co.'s foundry was entirely destroyed by fire Wednesday evening, March 19. There was no stove in the room where the fire started, nor fire in the boiler, for the men employed by the company had been on a stride for several weeks. The origin of the fire is unknown. The loss is estimated at $20,000.

General Industrial Notes:—

The Hazelton Tripod Boiler Co., of Chicago, under the direction of Capt. Hallett, has just completed the foundation for a boiler at the Linden Steel Works, Pittsburgh, says the *Dispatch*, that will be 56 feet high when put in place, and the Captain claims it will be the largest boiler in the world.

A dispatch from Scranton, Pa, dated March 9th, says that "the Scranton Steel Works last week exceeded the world's record in the manufacture of steel ingots by 414 tons, with two 6½-ton converters, the total output being 5,456¼ tons, against the previous run of the Lackawanna Iron & Coal Co.'s unexcelled output with two 7-ton converters of 5,042¾ tons. The company also recorded the largest turn and day record during the week, the former being 800 tons and the latter 1,400 tons."

As the announcement that the Aerated Fuel Co. have made the Gilbert & Barker Manufacturing Co., of Springfield, Mass., their general agents for the United States has led many persons to think that the other representatives of the former company had given up their connection with it, these representatives wish it understood that they are still the sole licensees for the Aerated Fuel Co.'s system for the territory assigned to them. All persons interested, therefore, in this system in Southern New York, Eastern Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia, are requested to apply to W. S. Collins, 171 Broadway New York, who is prepared to put in the system, complete, with a guarantee of its success.

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AN UNEXPECTED TRIBUTE TO PROTECTION.

The following significant article is from the London *Iron and Coal Trades Review*, of January 31:

According to the statistics just published by the American Iron and Steel Association, more puddling furnaces, rolling mills, heating furnaces, open-hearth steel furnaces, etc., are being built at the present time than was the case two years ago, when there was greater need of them. A formidable addition is also being made to the number of blast furnaces, 27 being in process of erection, as compared with 30 in 1887.

It is not to be supposed that, when America is in a position to supply her own requirements of both iron and steel, production will only be carried to this level. Nothing can be more certain than that the American iron and steel masters will, when that time comes, endeavor to find outlets for their superfluous products rather than damp down their furnaces, and it is probably in view of this contingency that efforts are now being made in the United States—and apparently not without some success—to create a commercial league among all the republics of the American Continent on the basis of reciprocity in their dealings with one another. Apart, however, from such considerations as these, it is certain that America, for some time past, has been taking our steel and iron manufactures in constantly diminishing quantities, and that, as far as these commodities are concerned, the United States will, in a few more years, cease to count as an important market for this particular class of British goods. In pig iron, hoops, boiler plates, railroad material, unwrought steel, steel rails, scrap iron and many other products, our exports to America have, within the past few years, largely declined, so much so, indeed, that we are compelled to acknowledge that the importance of the United States as a market for the articles enumerated is rather exaggerated, though the fiction will doubtless survive for a little while longer. Nor is it in the least degree likely that the future will alter the situation in this respect, for it must be borne in mind that the Americans are not only greatly improving, but reducing the cost of their processes of manufacture, and that, although wages are still considerably lower here than in the United States, this advantage, for the reason mentioned, is not so great as it may seem.

We are, therefore, forced to conclude that, just as in the case of crude iron, steel, and certain descriptions of manufactured iron, the United States will shortly be completely independent of us in other respects. That market—valuable as it undoubtedly was but a few years since—is becoming of less importance to us day by day. Protection, which it was thought would only impede the progress of the American iron industry, has proved to be the very "rock of its salvation," and, much as we may regret the result for our own sake, the American people, it must be admitted, have shown a much keener appreciation of what was essential to their progress than our own *doctrinaires* would be willing to admit. When the time, however, comes when the American iron and steel manufacturers will be forced to look for markets abroad Protection will help them but little. This Germany is already finding out to her cost, and the same experience undoubtedly awaits the United States. So long as production barely equals the home consumption the American iron and steel industries will continue to flourish under the existing *regime*, but no longer. Already production promises to exceed consumption in a very short time, and when that point is reached America will have to alter, perhaps entirely recast, her whole fiscal system. Until then there will be a steady growth in American iron and steel production, characterized by great prosperity for both masters and workmen. It will be otherwise when foreign markets become a necessity for the United States, as they are for us at the present moment. Meanwhile it behooves us to strengthen our position wherever we can, and to lose no opportunity of opening up fresh fields for our own superabundant energy and enterprise.

Electric Heating.

The enormous heating power of the electric current, which the introduction of the dynamo demonstrated, led to the early suggestion that the current, besides its utilization for light and power, might be employed as a heating agent. Without entering into the possible economy such an employment of the electric current as compared with the other methods now in use, it is beyond question that, as a heating agent pure and simple, there is none which is more perfectly adapted to the purpose than the electric current, supplied, we will say, from a central station. It furnishes heat without any of the accompaniments which are invariably the adjuncts of other heating methods. An ingenious apparatus for this purpose, adapted specially for employment in connection with the alternating current, has been devised in which the secondary of an induction coil is made in such a form as to generate a maximum of current to produce the desired heating. As the inventor naively suggests, the heating of the iron core, so objetionable a feature in the usual alternating current apparatus, presents no obstacle to the successful operation of the electric heater, and might indeed be classed as one of its advantages.—[Electrical World.

Large-Size Gas Engines.

Messrs. Schleicher, Schumm & Co., of Philadelphia, makers of the Otto gas engines in this country, have recently been increasing the size of their engines far beyond the proportions once thought to be a limit. A number of engines of 50 horse-power have been made, and one of 100 horse-power, for driving dynamos, has recently been contracted for by a company in Wisconsin. The works at Philadelphia are crowded with orders, and this means a good deal, because the plant is one of the best in this country. The more extended use of gas engines during late years, has taken place at the same time with a very great advance in steam engine improvement, demonstrating the value of the gas engine beyond dispute; indeed, the race among heat engines seems to be in its favor at this time.—[Industry.

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THE MOST DESIRABLE LOCATIONS IN THE SOUTH for manufacturing wagons, stoves, agricultural implements, furniture, or for foundries, machine shops, rolling mills, muck bar mills, nail works, glass works, cotton or woolen mills, and tanneries, are to be FOUND IN VIRGINIA along the line of the Norfolk & Western Railroad from Norfolk to Bristol and upon its branch lines. HARD WOOD OF EVERY VARIETY; PIG IRON from the furnaces at Lynchburg (2), Roanoke (2 in operation and 1 now under construction), Pulaski (1), Ivanhoe (1), Radford (1 to be built in 1890), Salem, Graham, Max Meadows and Bristol (1 at each point now under construction); bar iron from the rolling mills at Roanoke, Lynchburg and Richlands (1 to be built in 1890); COKE AND SEMI-BITUMINOUS COAL **from the Pocahontas Flat Top Field;** SUPERIOR GAS COALS from mines on the Clinch Valley extension; GLASS SAND from Tazewell Co.; COTTON FROM THE MARKETS of the Southern States, and Wool from all the Western and Southwestern States and Territories, at advantageous freight rates. FAVORABLE FREIGHT RATES made upon raw materials to all factories established upon its line, as well as to points in the United States and Territories, upon the manufactured articles.

Those seeking new fields for manufacturing establishments should not fail to investigate **the wonderful development of Iron, Coal and Coke Industries that has been made within the past five years along the line of the Norfolk & Western Railroad, and the advantages offered by the State of Virginia in the supply of cheap raw materials, by the Norfolk & Western Railroad** in the matter of freight facilities and rates upon raw materials and for reaching home, far distant and foreign markets, and by the cities and towns along its line in the way of advantageous sites, at moderate cost. Many of the cities and towns exempt manufacturing establishments from taxation for a series of years.

For further information as to freight rates and sources of supply of raw materials, apply to A. POPE, General Freight Agent, Roanoke, Va., or to

CHAS. C. EDDY.

Vice-President,

ROANOKE, VA.

THE CANADIAN DUTY ON IRON CASTINGS.

A deputation of foundrymen, stove manufacturers and others, consisting of Messrs. E. Gurney and J. H. Patterson, of Toronto; John McClary, London; W. Young, Hamilton; Henry Garth, A. Debois, W. Gregg, H. R. Ives and T. Massey, of Montreal, has interviewed the Ministers of Finance and Customs, to urge an increas of the duty on castings. They represented that when the duties on iron were rearranged three sessions ago no provision was made for an increase of the duty on stove castings. Since that time the manufacturers represent that they have suffered much from American competition, and more particularly from under valuation at the custom house, which seems almost impossible to avoid as the tariff is at present. An important cause of the under valuation is the fact that many of the imported castings are made in American prisons, whence they are taken to one of several jobbing machine shops, there finished, and shipped to this country at prices far below what the product of free paid labor would cost. Not only does this class of castings compete with the work of our own manufacturers, but the duty it should carry is not collected, as the duty is collected on the basis of the American price. No one pretends that this price represents what the castings are worth, and in estimating the duty upon them, our customs officials have to recognize the fact that the articles are of prison manufacture.

To avoid both the stiffness of the foreign competition, and the injustice to our manufacturer of under-valuation, the deputation proposed that instead of an ad valorem duty of 30 per cent., the Canadian government should put on a specific duty of 1¼c. a pound. Then, no matter where, or how cheaply the castings had been produced, every pound of castings would pay its full duty.

This plan would also equate the duty on both sides of the line, for the United States charges 1¼ cents per pound on castings that its makers import. It appears reasonable to expect that the petition of the manufacturers will be granted, as it is in keeping with the trade policy of the government.—[Hardware, Toronto.

THE frontispiece in *Wide Awake* for April, by W. L. Taylor, "Easter Offerings," embodies the spirit of youth and bloom and gladness, while Mr. Butterworth's beautiful story, "The Pilgrims' Easter Lily," ought to go far to settle the question of America's national flower. W. J. Rhees of the Smithsonian Institution, under the title of "What's in a name?" gives a brief history of the English founder of the famous institution at Washington, with three portraits of Smithson, and then goes on to give fifty or more examples of the mistaken ways in which people address letters to the institution.

THE Russian government is building a railroad across Siberia to the Pacific Ocean. There will be 4,000 miles of track and 2,500 miles of river transportation.

THIRTY-FIVE million dollars of railway iron and steel orders in the market promise another big year in the iron trade for 1890.

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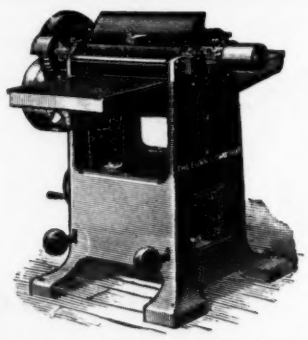

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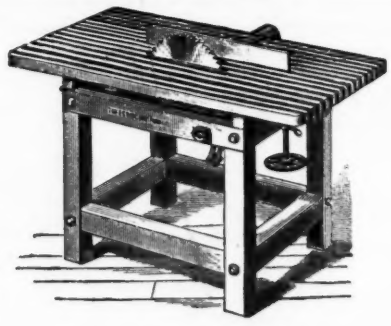

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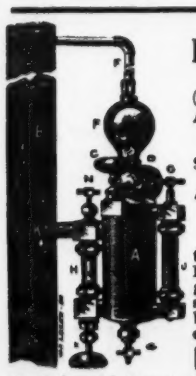

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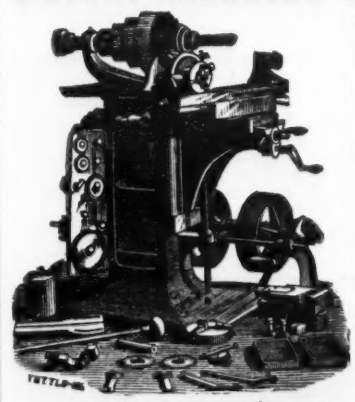

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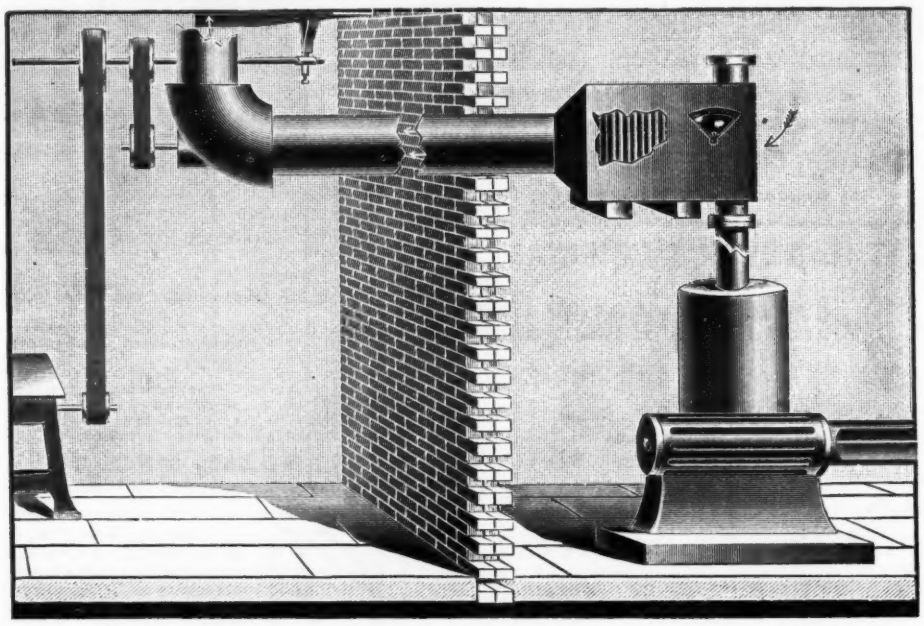

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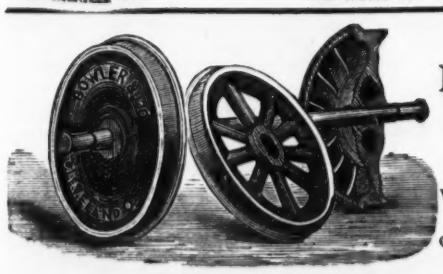

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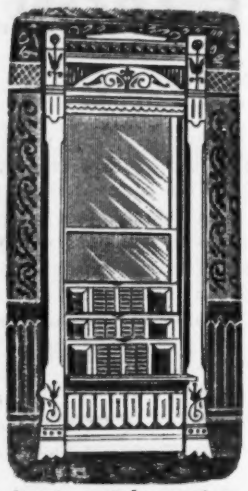

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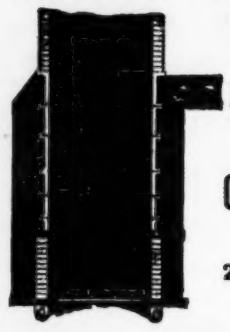

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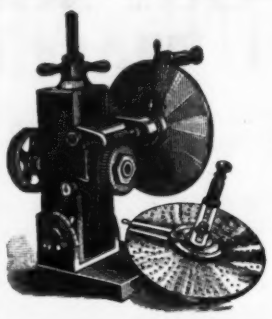

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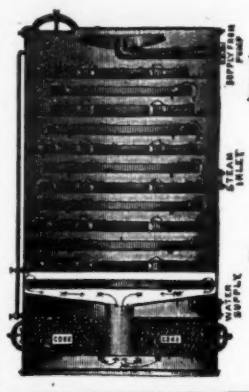

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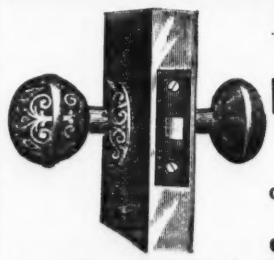

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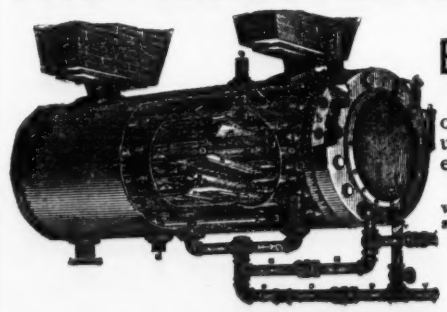

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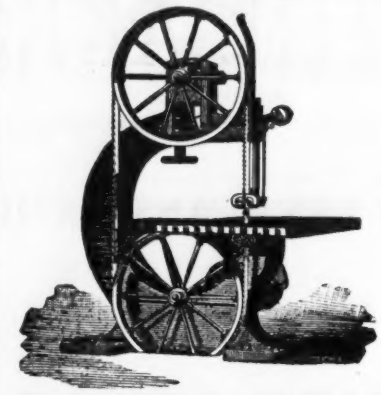
SPRINGFIELD, OHIO.



$80 will buy the best No. 1 band saw in th world.
$100 will buy our new No. 2 40" band saw.
$185 will buy our new patent band re-saw ing machine.
$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one saw.
$125 our new No. 2 complete as above.
For further particulars address

STANDARD MFG. CO.,

110-120 Main St., Mt. Carmel, Ill.

HEADQUARTERS FOR

ANIMAL POKES

They prevent animals from breaching or being injured by barbed wire. Best in the market. Recent valuable improvements. Prices low. Factory extensive and reliable. Send for catalogue and price list.

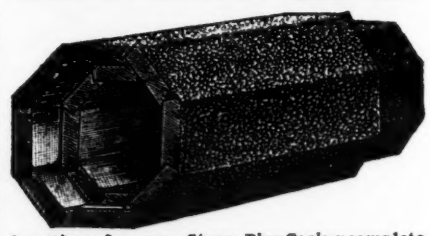
A. W. BISHOP, Berea, O.

STRONG, WELL BUILT, SERVICEABLE

STEAM ENGINES

12 to 80 HORSE POWER.

Adapted to HEAVY, CONTINUOUS WORK.
EVERY ENGINE TESTED UNDER FULL LOAD.
FOR DESCRIPTIVE CIRCULARS ADDRESS
CHANDLER & TAYLOR CO. INDIANAPOLIS, IND.



A section of our new Steam Pipe Casing complete.

A. WYCKOFF & SON,

Elmira, N. Y.

Patent Steam Pipe Casing

For Underground Steam Pipes.

Send for Circular and Prices.

Two staves removed to show the lining between the inside and outside staves.

Steam Jet Pumps,	From	$4.00 up.
Automatic Injectors,	"	$5.00 up.
High Lifting Injectors,	"	$6.00 up.
Shafting, Hangers,	"	$1.00 up.

COUPLINGS, BOXES, COLLARS, ETC.
Write for Circulars, Etc.

COLUMBIA INJECTOR CO., CLEVELAND, O.

THE SWEET & CLARK CO., Marion, Ind.

Manufacturers of REFINED AIR FURNACE MALLEABLE IRON.

Superior advantages on account of Natural Gas Fuel. Also manufacturers of Curry-Combs, Hardware and Saddlery Hardware Specialties. ☞Write for Price List and Catalogue.

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

STEEL

WHEELBARROWS

FOR

Rolling Mills.

GRANT McNEIL,

AKRON, O.

Send for barrow circular.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, four months): Bessemer, $25 30; No. 1 Foundry, $20 30; No. 2 Foundry, $19 30; No. 1 Gray Forge, red short, $18 80; No. 2 Gray Forge, neutral, $17 30; No. 1 American Scotch, $20 30; No. 2 American Scotch, $19 30.

CHICAGO (reported by Messrs. Rogers, Brown & Co.): Southern Coke No. 1. Foundry, $18 75 @19 25; Southern Coke No. 2 Foundry, $18 25 @18 75; Southern Coke No. 3 Foundry, $17 75 @18 25; Southern Coke No 1, Softeners, $18 75 @18 75; Southern Coke No. 2, Softeners, $17 75 @18 25; Ohio Silveries No. 1, $18 75@19 75; Ohio Silveries No. 2, $17 75@ 18 75; Ohio Strong Softeners No. 1, $20 25@20 75; Ohio Strong Softeners No. 2, $19 25@19 75; Lake Superior Charcoal Nos. 1 to 6, $21 50@22 00; Tennessee Charcoal No. 1, $20 50@21 00; Tennessee Charcoal No. 2, $20 00@20 50; Southern Standard Car Wheel, $25 00@26 00; Tennessee Standard Car Wheel, $21 50@22 00; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $23 00@25 00; Old Car Wheels, $00 00@00 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $17 40@17 90; Southern Coke No. 2 Foundry (new classification), $16 90@ 17 40; Southern Coke No. 3 Foundry (new classification), $16 40@16 90; Grey Forge, $15 90@16 40; White and Mottled, different grades, $15 15@15 65; Silver Grey, different grades, $15 90@16 40; Southern Charcoal No. 1 Foundry, $18 75@19 75; Southern Charcoal No. 1 Mill, $17 50@18 00; Southern Car Wheel, Standard brands, $23 50@24 50; Southern Car Wheel, other brands, $19 25@21 75; Hanging Rock Coke No. 1 Foundry, $18 75@19 75; Hanging Rock Charcoal No. 1 Foundry, $22 00@ 22 50; Hanging Rock Cold Blast, $24 00@26 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $17 50@17 75; Southern coke No. 2, $17 00@17 50; Southern coke No. 3, $16 00@16 50; Mahoning Valley (Lake ore mixtures), $19 00@19 50; Southern charcoal, No. 1, $18 00@18 50; Southern charcoal, No. 2, $17 50@18 00; Missouri charcoal, No. 1, $19 00@19 50; Missouri charcoal, No. 2, $18 75@19 00. FORGE—Neutral coke, $16 00@16 50; Cold short, $16 00@16 50; Mottled, $14 50@15 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 00@ 23 50; Southern (other brands), $19 50@20 50; Lake Superior, $23 00@23 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $18 25@18 75; Southern Coke No. 2, $17 75@18 25; Southern Coke No. 3, $17 25@17 75; Southern Grey Forge, $16 75@ 17 25; Southern Charcoal No. 1, $19 75@20 25; Southern Charcoal No. 2, $19 25@19 75; Missouri Charcoal No. 1, $19 75@20 25; Missouri Charcoal No. 2, $20 00@20 50; Ohio Softeners, $20 00@ 21 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $23 50@24 50; Southern, $21 00@ 24 50. CONNELLSVILLE COKE—East St. Louis, $5 65; St. Louis, $5 80.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $20 25@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $19 25 @00 00; Niagara No. 1, $20 25@00 00; Niagara No. 2, $19 25@00 00; Niagara No. 3, $18 25@00 00; Ohio Softener No. 1, $19 50@00 00; Ohio Sofener No. 2, $18 50@00 00; Lake Superior Charcoal, $22 75@00 00; Tennessee Charcoal, $21 25@00 00; Southern Softener No. 1, $19 50@00 00; Southern Softener No. 2, $19 00@00 00; Alabama Car Wheel, $25 50@00 00; Hanging Rock Charcoal, $24 50@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $22 00@23 00; Lake Superior (coke) Bessemer, $22 50@23 50; Katahdin (Maine charcoal), $26 00 @26 50; Lake Superior Coke, Foundry, all ore, $20 50@21 00; Lake Superior Coke, Foundry Cinder Mixed, $19 00@20 00; Standard Ohio Black Band, $19 75@20 50; Southern No. 1, $18 50@19 00; Southern Gray Forge, $16 25@ 16 75; Jackson County (Ohio) Silvery, $19 25@ 19 75; Old Car Wheel, $20 00@21 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $19 00@19 50; No. 2 Foundry, $18 00@18 50; Grey Forge, $17 00@17 25; White and Mottled, $16 00@16 50; Warm Blast Charcoal, $20 00@24 00; Cold Blast Charcoal $25 00 @29 00; Bessemer, $20 50@21 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $17 50@18 00; Ohio and Southern Coke No. 2, $16 50@17 00; Ohio and Southern Coke No. 3, $16 00@16 50; Ohio Soft Stone Coal No. 1, $17 50@18 00; Ohio Soft Stone Coal No. 2, $16 50@17 00; Hanging Rock Charcoal No. 1, $21 00@23 00; Hanging Rock Charcoal No. 2, $21 00@22 00; Tennessee and Alabamba Charcoal No. 1, $18 50@19 00; Tennessee and Alabama Charcoal No. 2, $18 00@18 50. FORGE—Strong Neutral Coke, $15 50@16 00; Mottled Neutral Coke, $14 50@15 00; Cold Short Coke $15 00@16 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $23 00@25 00.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	2 00
4¼ to 6 by ⅜ to 1 inch	2 10
1¾ to 6 by 1⅜ to 2 inch	2 40
1¼ & 1⅜ by ⅜ to ¾ inch	2 10
1 & 1¼ by ⅜ to ¾ inch	2 20
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 40

Round and Square.

1 to 1⅞ inch	2 00
2 to 2¾ inch	2 20
2¾ to 3¼ inch	2 50
3⅜ to 4 inch	3 00
4¼ to 4½ inch	3 50
4¾ to 5 inch	3 70

Oval.

⅞ to 1¼ inch	2 40
⅜ to ¾ inch	2 60
½	2 80
⅜	3 20

Half Oval and Half Round.

1½ to 3 inch	3 10
⅞ to 1¼ inch	2 70
⅜ to ¾ inch	3 20
½	3 50
⅜	5 00

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 20
1 to 1⅜ by ¼ and 5-16 inch	2 30
¾ to ⅞ by ¼ and 5-16 inch	2 50
⅛ to ⅜ by ¼ and 5-16 inch	3 00

Hoops.

1¼ to 4, Nos. 13 to 15	2 80
1¼ to 2, Nos. 16 to 18	2 90
1¼ to 2, No. 19	3 05
1¼ to 2, No. 20	3 10
1¼ to 2, No. 21	3 20
1¼ to 2, No. 22	3 30
15-16, 1 and 1⅛, Nos. 13 to 15	3 00
15-16, 1 and 1⅛, Nos. 16 to 18	3 10
15-16, 1 and 1⅛, Nos. 19 and 20	3 20
15-16, 1 and 1⅛, No. 21	3 30
15-16, 1 and 1⅛, No. 22	3 40
⅞, Nos. 13 to 15	3 20
⅞, Nos. 16 to 18	3 30
⅞, Nos. 19 and 20	3 40
⅞, No. 21	3 50
⅞, No. 22	3 60
13-16, Nos. 13 to 15	3 40
13-16, Nos. 16 to 18	3 50
13-16, Nos. 19 and 20	3 60
13-16, No. 21	3 70
13-16, No. 22	3 80
¾, Nos. 13 to 15	3 50
¾, Nos. 16 to 18	3 70
¾, Nos. 19 and 20	3 80
¾, No. 21	3 90
¾, No. 22	4 00
11-16, Nos. 13 to 15	3 70
11-16, Nos. 16 to 18	3 90
11-16, Nos. 19 and 20	4 00
11-16, No. 21	4 10
11-16, No. 22	4 20
⅝, Nos. 13 to 15	4 00
⅝, Nos. 16 to 18	4 20
⅝, Nos. 19 and 20	4 30
⅝, No. 21	4 40
⅝, No. 22	4 50
⅝, No. 23	4 60

Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 50
1¼ to 6 by Nos. 11 and 12	2 60
1 to 1⅜ by ⅛ to 3-16 in	2 60
1 to 1⅜ by Nos. 11 and 12	2 70
⅞ and 13-16 by ⅛ to 3-16 in	2 90
⅞ and 13-16 by Nos. 11 and 12	3 00
¾ and 11-16 by ⅛ to 3-16 in	3 20
¾ and 11-16 by Nos. 11 and 12	3 30
⅝ and 9-16 by ⅛ to 3-16 in	3 50
⅝ and 9-16 by Nos. 11 and 12	3 60
½ by ⅛ to 3-16 in	3 80
½ by Nos. 11 and 12	3 90

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	3 00
⅜ inch, " " " 13 and 14	3 20
½ inch, " " " 11 and 12	3 30
½ inch, " " " 13 and 14	3 50

Sheet Iron.

No. 10 to 14	2 75
No. 15 to 17	2 90
No. 18 to 21	3 10
No. 22 to 24	3 30
No. 25 to 26	3 45
No. 27	3 55
No. 28	3 65

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 80
C No. 1, " "	3 05
C H No. 1 " "	3 30
C H Flange, " "	4 05
Extra Flange, "	4 55
Solid Fire Box "	5 30

Steel Boiler Plates—1-4 in. and Heavier.

Tank	3 00
Shell	3 40
Flange	3 70
Marine Flange	4 10
Fire Box	4 80

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2¾ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6¼ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅜ thick	0

Bessemer and O. H. Steel.

Machinery	base price, 3 00
Tire	" 3 00
Spring	" 3 50
Sleigh Shoe	" 3 00
Toe Calk	" 3 25
Cutter Shoes, tapered and burr.	" 3 25

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

⅛, ⅜, 11-16 and ¾ inches diameter	4 00
Bridge ⅛, ⅜, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

NET TONS	
No. 1 R. R. wrought scrap	$20 00
No. 1 wrought scrap	18 00
No. 1 Machine cast scrap	14 00
Iron axles	24 00
Axle turnings	16 00
Wrought turning (free from cast)	13 50
Cast borings	10 00
Uncut wrought iron boilers	13 00
Steel boiler plates	17 00
Grate Bars	8 50
Pipes and flues (Clean)	14 00
Tank iron	14 00
Hoop and band iron	13 00
Sheet iron	10 00
Wrought drillings	12 00
Malleable iron	10 00
GROSS TONS	
Old iron T rails	26 00
Old steel rails	22 00
Old car wheels	18 50
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8⅛
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

H. N. HILL & CO.

Manufacturers' Agents' for

BOILER TUBES.
PLATE STEEL.
BOILER RIVETS.
NORWAY IRON RIVETS.
SMOKE STACK AND GASOMETER RIVETS.
BAR IRON.
BAR STEEL.
STEEL AND IRON ANGLES.
SHEET IRON.
SHEET STEEL.
RAILROAD AND BOAT SPIKES.
WROUGHT IRON PIPE AND FITTINGS.
PULLEYS, HANGERS AND COUPLINGS.
BEAMS AND CHANNELS.
STEEL RAILS AND CASTINGS.
GALVANIZED SHEET.
PORTABLE FORGES.
RAILROAD AND MACHISTS' SUPPLIES.

813 PERRY-PAYNE BUILDING,

Telephone 95. CLEVELAND, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 29 Mercantile Bank Building, CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

JAS. PATTERSON, Sales Agent

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716, 717, 718, 719 Perry-Payne Bld'g. CLEVELAND, O.

TUTTLE, OGLEBAY & CO.,

Commission Dealers in

Iron - Ores.

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS, CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore.

Perry-Payne B'ld'g, Cleveland, O.

THE CONDIT-FULLER CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

Pickands, Mather & Co.,

IRON ORE - -

—AND—

- - PIG IRON

Corner Bank and Superior Streets, CLEVELAND, O.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

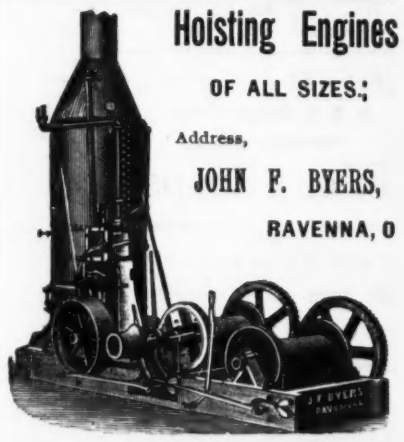
Hoisting Engines

OF ALL SIZES.

Address,

JOHN F. BYERS,

RAVENNA, O



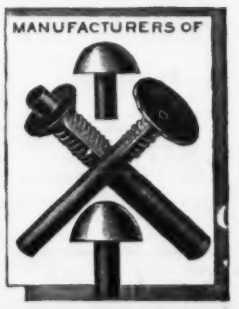
FOREST CITY **Machine Works.**

Wrought Iron Chaplets and Chaplet Stems.

LARGE HEAD RIVETS for stacks, Gasometers, Etc.

Works: 42, 42 and 44 Columbus St., and 37 Winter St., CLEVELAND, OHIO.

MANUFACTURERS OF



INDIANA MACHINE WORKS

FORT WAYNE INDIANA

BUILDERS OF

WOOD WORKING MACHINERY.

WRITE FOR DESCRIPTIVE CIRCULARS.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9¼

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shults Raw Hide Leather Belting, single,.....dis 35&5
Shults Raw Hide Leather Belting, double, and Light Double.....dis 35&5
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9¼@10¼

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 45
" Little Grant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
¼ kegs ₩ lb	4¼c	5¼c		2¾c
⅛ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3¼
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 70@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 60
Sheet Rubber.....₩ lb 22@24
Knowlton Rubber.....₩ lb 45

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 55

Rivets.

Iron, Thousand, list November 17,.....dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¼ inch and over.....₩ lb 15¼
Sisal, ¼ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay .....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12¾c	
3-Ply " 1½ lb Balls	11@11¾c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

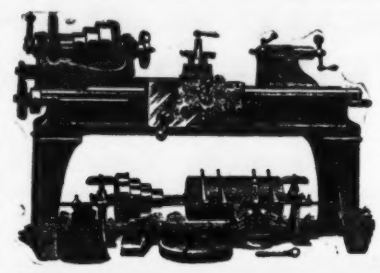
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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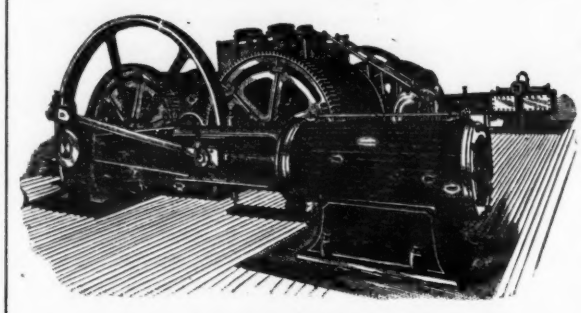

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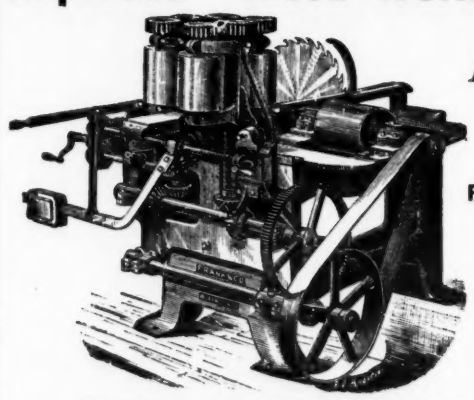

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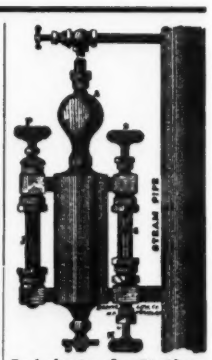

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nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 25@6 75
Others.....₩dos. $5 75@6 00
Full polished.....$8 25

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 70&12½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70
Loose joint, jap.....dis 70
Loose joint, jap. with acorns.....dis 70
Loose pin, acorns.....dis 70
Loose pin, japanned acorns.....dis 70
Loose pin, acorns, jap. plated tips.....dis 70
Wrought steel—
Wrought, fast joint, narrow.....dis 70
Wrought, fast joint, broad.....dis 70
Wrought, loose joint, broad.....dis 70
Table Butts, back flaps, etc.....dis 70
Regular inside blind.....dis 70
Light inside blind.....dis 70
Loose pin.....dis 70
Light loose pin.....dis 70

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb5¼@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No.	10	9	8	7	6	
Ausable,	₩ lb.	23	24	25	26	28.	dis 25&10@25&10&10
Putnam,	₩ lb.	18	19	20	21	23.	dis 15
Essex							dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 6
Escutcheons and keys.....dis 6
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₩ gross $4.80

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 00
Bishop's O K.....₩ doz $5 25
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $2 75

Rakes.

Cast steel.....dis 65&5
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

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Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds dis 70&5
Steel carpet tacks all kinds.....dis 70&5
Swedes iron carpet tacks, all kinds.....dis 70&5
Swedes iron tacks.....dis 70&5
Swedes iron Upholsterers' tacks.....dis 70&5
Tinned Swedes iron tacks.....dis 70&5
Tinned Swedes iron Upholsterers' tacks.....dis 70&10
American iron cut tacks.....dis 67½&5
Copper tacks.....dis 50
Copper finishing and trunk nails.....dis 50&00
Cigar box nails.....dis 45&10
Finishing nails.....dis 65
Hungarian nails and miners' tacks.dis 62½&5
Gimp and lace tacks.....dis 70&5
" " " tinned.....dis 66&10
Trunk and clout nails.....dis 66⅔
Tinned trunk&clout nails.....dis 66&10
Basket nails.....dis 66&10
Chair nails.....dis 66&10
Common and patent brads.....dis 66&10
Tinned capped trunk nails.....dis 60

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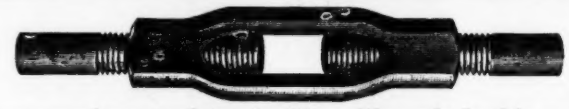

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PAGE.

Aluminum—
Cowles Electric Smelting & Aluminum Co., Cleveland..... 13
Animal Pokes—
A. W. Bishop, Berea, O..... 16
Bath Tubs –
*Michigan Bath Tub Co.. Homer, Mich.... 16
‡Instantanous Water Heating Co., Chicago, Ill..... —
Blowers—
Buffalo Forge Co., Buffalo, N. Y..... 23
Boring Machines—
*J. H. Osborne & Co., Union City, Ind..... 15
Bolts and Bolt Machinery—
Upson Nut Co., Cleveland..... 20
Colwell & Collins, Norway Bolt Co., Cleveland..... 20
*Seaton Mfg. Co., Cleveland..... —
Brick and Tile Machines—
D. J. C. Arnold, New London, O..... 18
Beltings—
Akron Belting Co., Akron, O..... 15
Belt Holders—
*W. R. Santley & Co., Wellington, O..... 13
Boilers and Boiler Attachments—
J. C. McNeil & Co., Akron, O..... 20
Enterprise Boiler Co., Youngstown, O..... 23
Unique Lubricator Co., Mansfield, O..... 18
Columbia Injector Co., Cleveland..... 16
Penberthy Injector Co., Detroit, Mich..... 24
Detroit Lubricator Co., Detroit, Mich..... 14
Wm. B. Pollock & Co., Youngstown, O..... 22
Alliance Steam Boiler Works, Alliance, O 20
Bolt Cutters—
H. B. Brown & Co., East Hampton, Ct..... 21
Burglar Alarms—
Cuyahoga Manufacturing Co., Cleveland.. 16
Bicycles—
Lozier & Yost, Toledo, O..... 13
Car Axles—
B. Barrett's Sons & Co., Wooster, O..... 19
Chaplets—
Forest City Machine Works, Cleveland... 17
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland..... 17
Cranes and Derricks—
Wm. Tod & Co., Youngstown, O..... 22
Harmar Foundry & Machine Co., Harmar, O..... 22
Car Wheels—
Bowler & Co., Cleveland..... 13
Clothes Bars—
Hulet, Holmes & Co., Berea, O..... 19
Damper Regulators—
*Curtis Regulator Co., Boston, Mass..... 11
Die Makers.
Avery Stamping Co., Cleveland..... 13
Door Hangers—
Taylor and Boggis Fdy. Co., Cleveland..... 24
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.. 16
*Lodge, & Davis Machine Tool Co., Cincinnati, O..... —
W. F. & John Barnes' Co., Rockford, Ills.. 22
Drop Presses—
Williams, White & Co., Moline, Ill..... 18
Engineers and Contractors—
E. H. Jones & Co., Cleveland..... 22
Elevators—
L. S. Graves & Co., Rochester, N. Y..... 14
Explosives—
Hercules Powder Co., Cleveland..... 23
Electrical Manufactures—
†Cleveland Electrical Mfg. Co., Cleveland —
Brush Electric Co., Cleveland..... 15
Elevator Buckets.
Avery Stamping Co., Cleveland..... 13
Emery Wheel Dressers—
W. W. Brisben, Cleveland..... 22
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill..... 24
W. F. & John Barnes' Co., Rockford, Ill... 22
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland..... 24
Murray & Heiss, Cleveland..... 21
Union Electrotype Foundry, Cleveland.... 14
Engines (Steam)
Kilby Manufacturing Co., Cleveland..... 24
E. H. Jones & Co., Cleveland..... 22
*Chandler & Taylor Co., Indianapolis, Ind. 16
The Westinghouse Machine Co., Pittsburgh, Pa..... 22
Geo. Worthington Co., Cleveland..... 22
Cleveland & Hardwick, Erie, Pa..... 22
Jas. Leffel & Co., Springfield, O..... 22
Wm Tod & Co., Youngstown, O..... 22
Skinner Engine Co., Erie, Pa..... 22
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 22
Van Duzen Gas Engine Co., Cincinnati, O..... 22
Engines (Hoisting)—
John F. Byers, Ravenna, O..... 23
Engineers' Specialties—
Crescent Manufacturing Co., Cleveland... 20
*Curtis Regulator Co., Boston, Mass..... 11
Standard Regulator Co., Buffalo, N. Y..... 23
Ejectors—
James Jenks, Detroit, Mich..... 16
Fans—
*Akron Heating & Ventilating Co., Akron, O..... 15
Flue Cleaners—
Crescent Manufacturing Co., Cleveland 20
For Sale—
Foundries, Furnaces, Machinery, etc..... 20
Files, Makers of—
Reynolds Bros., Columbus, O..... 24
A. & H. Gough, Cleveland..... 16
Forges—
Buffalo Forge Co., Buffalo, N. Y..... 23
Cleveland City Forge & Iron Co., Cleveland 23
Foundries—
Bowler & Co., Cleveland.....15 & 20
Taylor & Boggis Foundry Co., Cleveland.. 20
Curry & Co., Meadville, Pa..... 20
Thos. D. West. Foundry Co., Cleveland..... 19
Feed Water Heaters—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 24
Laidlaw & Dunn Co., Cincinnati, O..... 23
Armstrong Bros., Springfield, O..... 16
E. H. Jones & Co., Cleveland..... 22
Cox & Morrison, Wheeling, W. Va 16
Foundry Cupolas—
Victor Colliau, Detroit, Mich..... 16
Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass..... 11
Galvanizers.
Avery Stamping Co., Cleveland..... 13
Gas and Gasoline Stoves—
Schneider & Trenkamp Co., Cleveland..... 14
Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa..... 16
Hangers—
S. C. Tatum & Co., Cincinnati, O..... 19
Hardware—
W. Bingham Hardware Co., Cleveland..20 & 19
Geo. Worthington Co., Cleveland..... 22
Bronson Supply Co., Cleveland..... 15
Hot Air Furnaces—
Beecheer Furnace Co., Cleveland..... 21
Iron and Steel Roofing—
Sykes Iron Roofing Co., Niles, O..... 23
Cambridge Iron Roofing Co., Cambridge, Ohio..... 23
Garry Iron Roofing Co., Cleveland 23
Standard Iron Co., Bridgeport, O..... 23
Thompson Manufacturing Co., Cleveland, 23
W. G. Hyndman & Co., Cincinnati, O..... 23
W. J. Burton & Co., Detroit, Mich..... 23
Kanneberg Roofing Co., Canton, O..... 23
*Merchant & Co., Philadelphia Pa..... —
Iron (Malleable)—
Sweet & Clark Co., Marion, Ind..... 17
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland..... 17
Tuttle, Oglebay & Co., Cleveland..... 17
J. H. Outhwaite & Co., Cleveland..... 17
Condit-Fuller Co., Cleveland, O..... 17
Pickands, Mather & Co., Cleveland....16 & 17
H. N. Hill & Co., Cleveland..... 17
E. C. Pope, Cleveland..... 17
Illuminating Apparatus—
Wheelock & Crichton, Chicago, Ill..... 13
Lath Mills—
D. S. Abbott, Olean, N. Y..... 21
Lumber—
Martin & Barris, Cleveland..... 20
Lathes—
Sebastian, May & Co., Cincinnati, O..... 18
H. L. Shepard, Cincinnati, O..... 16
*Lodge, & Davis Machine Tool Co., Cincinnati, O..... —
Lifting Jacks—
F. M. De Weese, Chillicothe, O..... 21
Mantels, Grates, Etc.—
Conger & Collins Mantel Co., Cleveland... 24
Manufacturing Sites—
Chas. G. Eddy, Roanoke, Va..... 12
*Muncie Natural Gas Land Improvement Co., Muncie, Ind..... 11
East Chattanooga Land Co., Chattanooga, Tenn 20
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O..... 18
Machinery (Foot Power)
W. F. & John Barnes' Co., Rockford, Ill... 22
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O..... 20
Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland.....20 & 24
Garvin Machine Co., New York..... 14
Office Furniture—
Burgess & Fish, Cleveland..... 21
Oil Fuel Process—
Aerated Fuel Co., Springfield Mass.....19
Patents—
Osborne & Co., Cleveland..... 13
*Thos. P. Simpson, Washington, D. C..... 20
Plumbers and Steam Fitters—
Ohio Heatinn, Plumbing & Mnfg. Co., Cleveland..... 14
Pumps (Steam)—
E. H. Jones & Co., Cleveland..... 22
Laidlaw & Dunn Co., Cincinnati, O..... 22
Hamar Foundry & Machine Co., Hamar, O..... 22
Rumsey & Co., Seneca Falls, N. Y..... 11
Van Duzen & Tift, Cincinnati, O..... 21
Pipe Coverings—
A. Wyckoff & Son, Elmira, N. Y..... 16
Planers—
Parkin & Bosworth, Cleveland..... 24
Post Hole Augers—
*J. H. Osborne & Co., Union City, Ind..... 20
Punching and Shearing Machine—
Williams, White & Co., Moline, Ill..... 18
Pulleys—
Geo. Worthington Co., Cleveland 22
S. C. Tatum & Co., Cincinnati, O..... 19
Printing Inks—
Ault & Wiborg, Cincinnati, O..... 13
Paint—
Iron Clad Paint Co., Cleveland, O..... 12
Nubian Iron Enamel Co., Chicago, Ill..... 31
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill..... 13
Rolled Steel—
Wilmot & Hobbs Mfg. Co., Bridgeport, Conn..... 24
Railroads—
Time Tables, Etc..... 21
Railway Supplies—
Bowler & Co., Cleveland..... 13
Cleveland City Forge & Iron Co., Cleveland..... 23
Rivets—
Forest City Machine Works, Cleveland..... 14
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland..... 17
Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass..... 11
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 19
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland..... 20
Saws—
Detroit Saw Works, Detroit, Mich..... 11
Peter Gerlach & Co., Cleveland..... 21
Shapers—
*Lodge & Davis Machine Tool Co., Cincinnati, O..... —
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland..... 17
Sheet Steel—
Standard Iron Co., Bridgeport, O..... 23
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa..... 11
Stampers of Sheet Metal—
Avery Stamping Co., Cleveland..... 13
Tinning Steel, Etc.
Avery Stamping Co., Cleveland..... 13
Twist Drills—
Cleveland Twist Drill Co., Cleveland..... 24
*Standard Tool Co., Cleveland..... —
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland..... 23
Central Iron & Steel Co., Brazil, Ind..... 19
Tackle Blocks—
Fulton Iron & Engine Works, Detroit, Mich..... 24
Type Founders—
Franklin Type Foundry, Cincinnati, O... 21
Wheelbarrows and Trucks—
Grant McNeil, Akron, O..... 17
Lansing Wheelbarrow Co., Lansing, Mich 13
Window Blinds—
Hartman & Durstine, Wooster, O..... 16
Wire Goods—
*F. Powell & Co., Toledo, O..... 20
Wire Machinery—
John Adt & Son, New Haven, Conn..... 16
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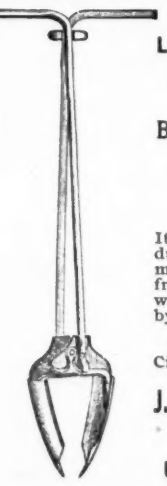

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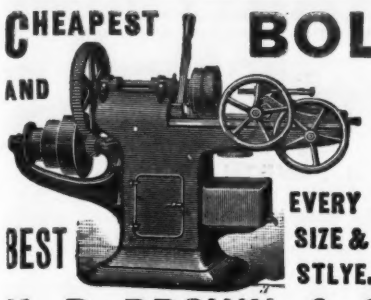

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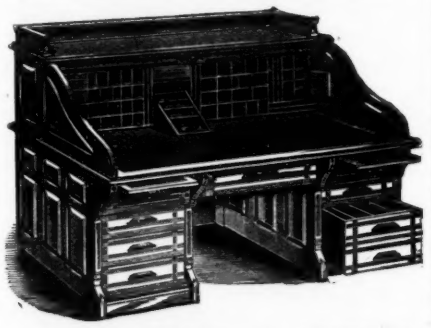

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Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 45 a m	*6 25 p m
Marietta Express.....	†11 15 a m	†2 25 p m
Valley Junction Express...	*4 15 p m	*10 25 a m
Cleve. and Canton Express	*7 05 p m	†8 20 a m

*Daily. †Daily, except Sunday.

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	Depart.	Arrive.
Wheeling Express.....	6 45 a m	6 55 p m
Ohrichsville Express.....	4 00 p m	9 20 a m

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PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	8 00 a m	d5 25 a m
	1 05 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	8 00 a m	12 50 p m
	1 05 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	9 40 a m
Ravenna Accom.....	5 00 p m	8 25 a m

d Daily. *Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt. Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 10 a m	d 7 00 a m
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Zanesville, Gambier, Mt. Vernon and Columbus.	1 05 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 10 a m	5 40 p m
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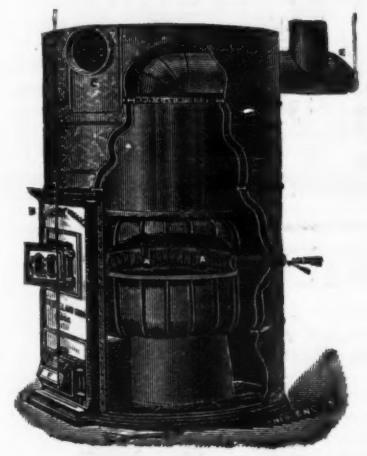

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No. 66, Mantua Accommo.....	* 4 20 p m
No. 68, New York Vestibule Limited.	* 8 30 p m
No. 70, Pittsburgh Local Express.....	*11 25 a m
No. 74, Pittsburgh & Youngst'n Ex...	†11 00 p m
	Arrive.
No. 65, Fast New York Express.....	*10 15 a m
No. 61, N. Y. & Pittsburgh Express...	* 7 15 a m
No. 71, Leavittsburg Local.....	† 2 10 p m
No. 67, Pittsburgh Express.....	*12 45 p m
No. 63, New York Express.....	* 6 50 p m
No. 63, Pittsburgh Express.....	* 6 50 p m
No. 69, Pittsburgh Local Express.....	† 9 10 p m
No. 73, Mantua Accommo.....	* 7 20 p m
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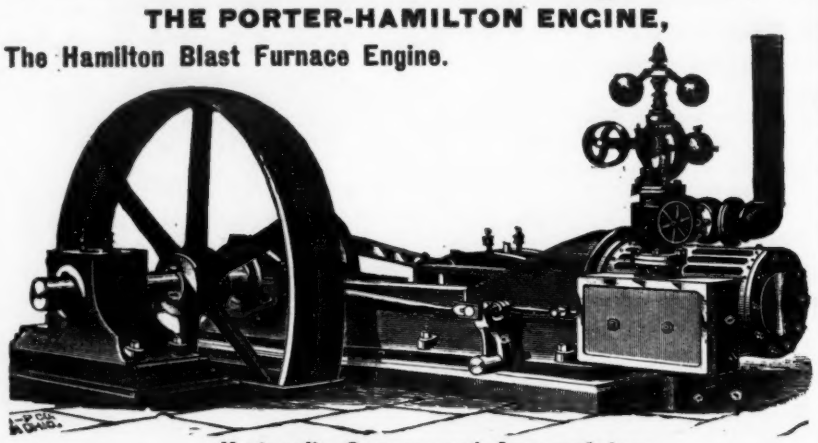

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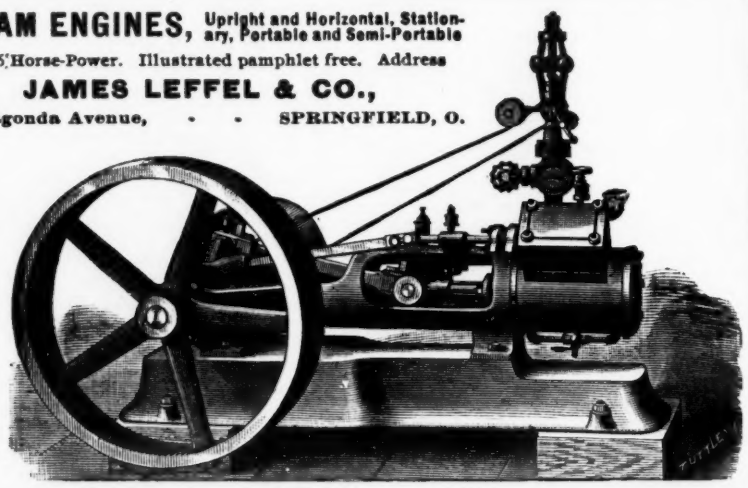

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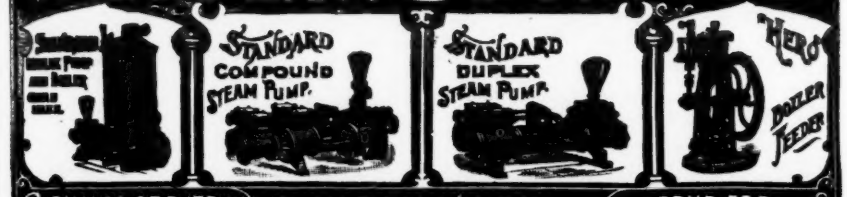

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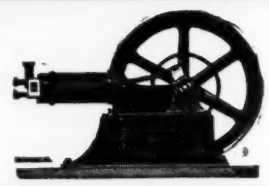

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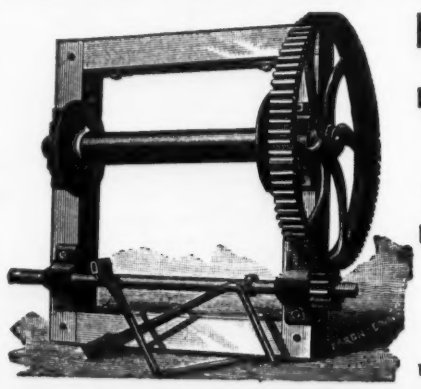

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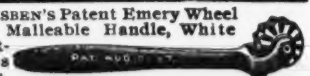

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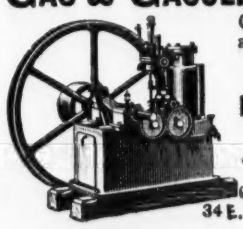

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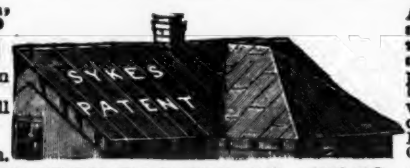

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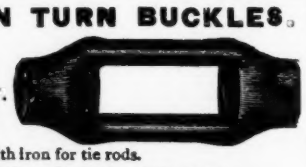

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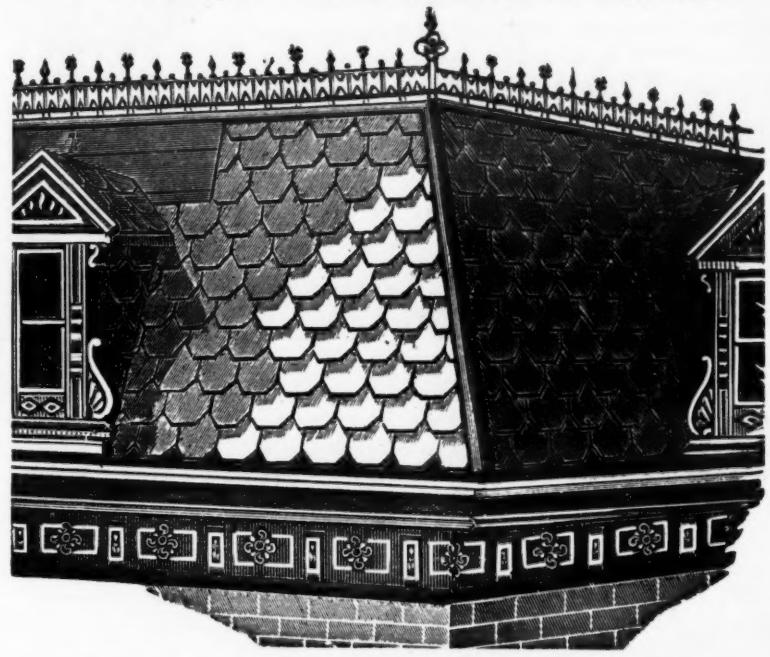

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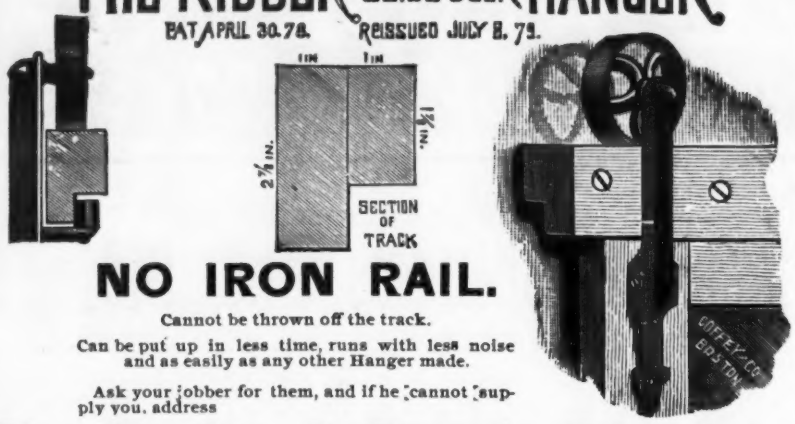

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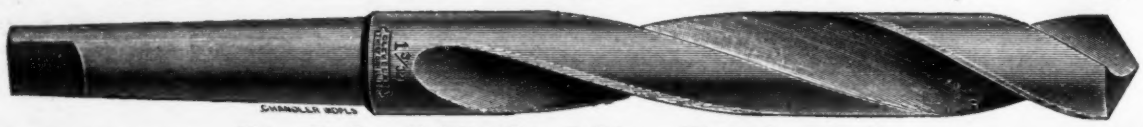

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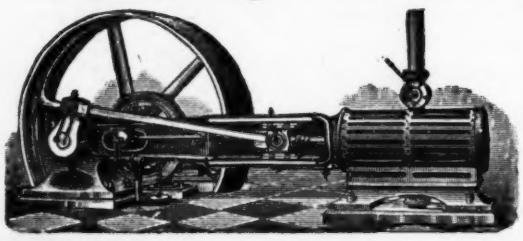

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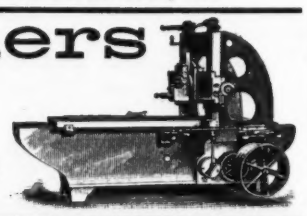

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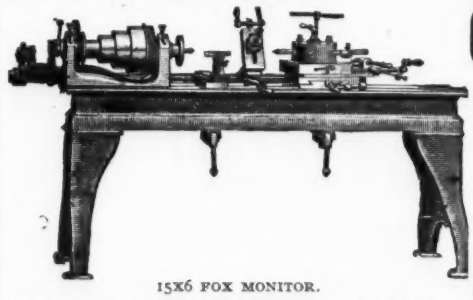

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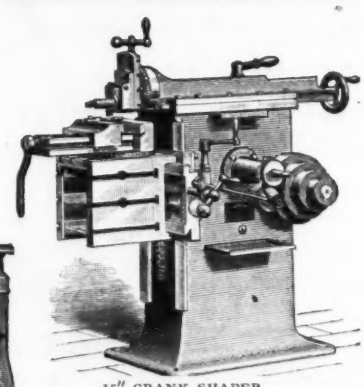

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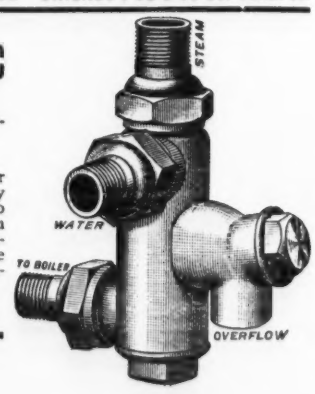

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